THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED

THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS REVIEW, COPPER AND BRASS

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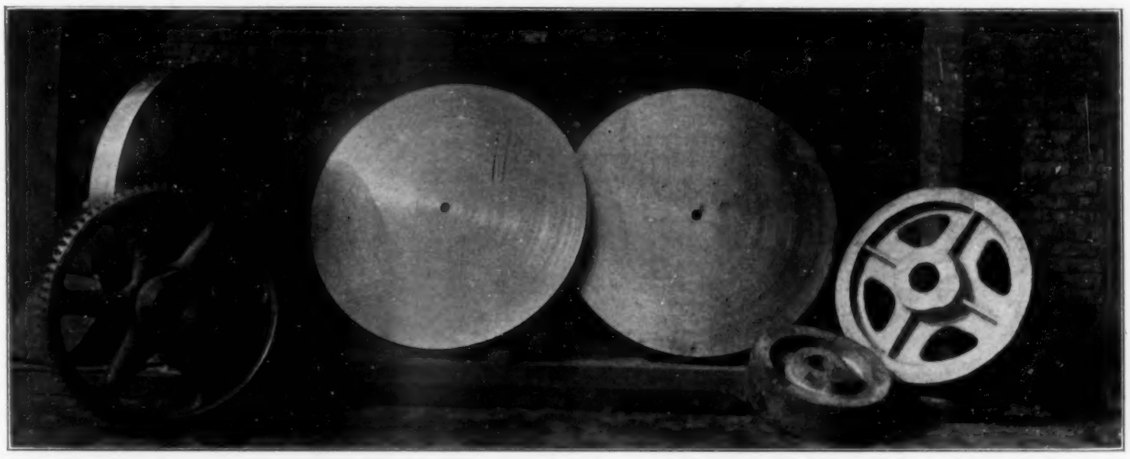
BRONZE GEARS AND PIVOT DISCS FOR OPERATING MACHINERY ON EMERGENCY DAMS OF THE PANAMA CANAL

The photograph below shows three of the Parsons' manganese bronze forged discs made by the William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa., and furnished to the American Bridge Company for the operating machinery on the emergency dams of the Panama Canal. The photograph also shows a number of bronze gear blanks made by the same company and furnished to the Otis Elevator Company, New York; also for the Panama Canal. A series of physical tests made upon four of these discs, two of the gear blanks and on three gear blanks made of a copper-tin composition resulted as shown in the table below:

Compression tests of the bronze discs are as follows:

Original length, .9960 in.

Pounds Per Sq. In.	Permanent Set in Inches.	Successive Perman't Set in Inches.
44,000	.0000	.0000
50,000	.0005	.0005
53,000	.0005	.0000
56,000	.0005	.0000
58,000 (elastic limit)	.0010	.0005
****	****	****
****	****	****
100,400	.0140	.0040



THE DISCS AND GEAR BLANKS SHOWN HERE ARE MADE OF PARSONS' MANGANESE BRONZE, FOR THE PANAMA CANAL.

PARSONS' MANGANESE BRONZE FORGED DISCS.

MARKED.	SIZE.	Area in Square Inches.	Broke at in Lbs.	Strain per Square Inch in Lbs.	Limit of ELASTICITY in Lbs.	Limit of ELASTICITY per square inch in Lbs.	Elongation in Inches.	Elongation per cent. of original Length.	Area of Reduced Section in Sq. In.	Reduction per cent. of Original Sec.	MEMORANDA.
7982	.505	.200	24,400	122,000	17,500	87,500	.34	17.0	.165	17.5	Circumferential Test Piece.
7747	"	"	24,650	123,250	17,800	89,000	.40	20.0	.161	19.5	Radial " "
8012	"	"	24,400	122,000	17,500	87,500	.39	19.5	.158	21.0	Center " "
7748	"	"	24,600	123,000	17,400	87,000	.37	18.5	.158	21.0	Center " "
PARSONS' MANGANESE BRONZE GEAR BLANKS.											
8114	.505	.200	15,960	79,800	8,240	41,200	.70	.35	.120	40.	Gear blanks for Otis Elevator Company.
7951	"	"	16,300	81,500	8,300	41,500	.66	.33	.124	38.	
COPPER AND TIN BRONZE GEAR BLANKS.											
7828	.505	.200	11,170	55,850	4,500	22,500	1.03	51.5	.098	51.0	
8101	"	"	11,300	56,500	4,700	23,500	1.45	73.0	.098	51.0	
8102	"	"	8,500	42,500	4,220	21,100	.70	35.0	.134	33.0	

A BRASS MILL ON THE HUDSON

INTERESTING DEVELOPMENTS OF THE BRASS INDUSTRY ALONG THE HUDSON RIVER.

A visitor to Hastings-on-the-Hudson who was acquainted with the activities of the Naugatuck Valley, Conn., in the brass and copper industries, would be liable to rub his eyes and wonder whether he was dreaming or still in the valley. Stretching along the Hudson River for a distance of nearly half a mile are the buildings of an enterprise that in its entirety will undoubtedly rival in size, equipment and output Waterbury, the brass city's, largest establishments.

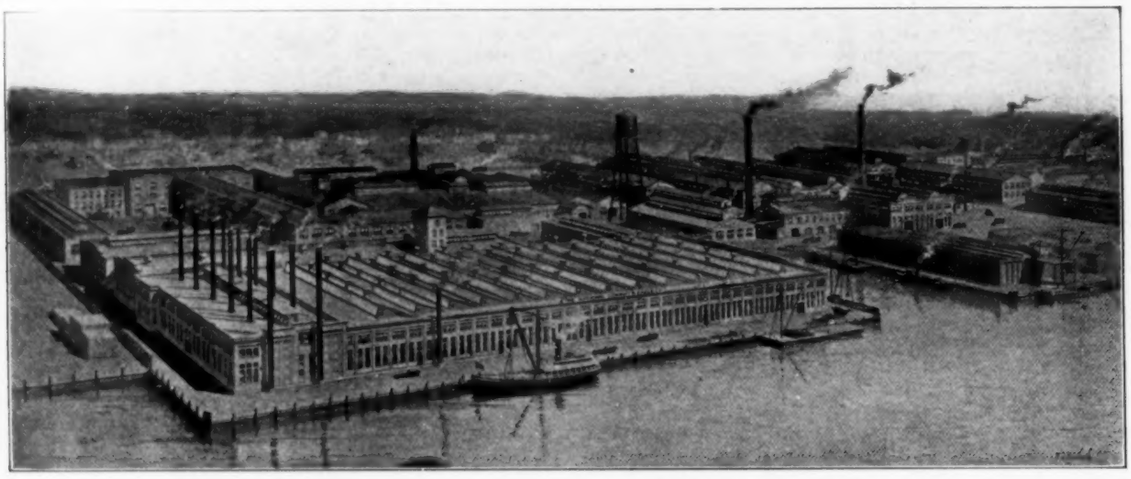


FIG. 1. TUBE, ROD AND WIRE MILLS OF THE NATIONAL BRASS AND COPPER TUBE COMPANY AT HASTINGS-ON-THE HUDSON SHOWN IN THE FOREGROUND.

The plant shown in Fig. 1 comprises the installation of the National Brass and Copper Tube Company, organized between five and six years ago with the acquisition of C. S. Morse by the National Conduit and Cable Company. Mr. Morse, one of the oldest and best-known men in the brass and copper business in the Waterbury district, left the Benedict & Burnham Manufacturing Company shortly after the absorption of this company by the American Brass Company, and cast in his lot with the men on the Hudson.

Given a free hand in the business he so well understood, Mr. Morse, ably assisted by Mr. F. S. Loomis, also a "Benedict man," went to work and built, equipped and started the first tube mill on the Hudson River. This is the mill seen in the foreground in Fig. 1. Under Mr. Morse's efficient management the business grew, and finally a rod and wire mill was added. Following the establishment of the tube, rod and wire mills, the output of which is placed at over 2,000,000 lbs. per month, a brass foundry was added. This increased the efficiency of the company as a brass producer greatly, for it enabled them to furnish the metal in sand castings as well as tubes, rods and wire.

The last unit of the wonderful organization growing so quietly near the mills dominating the Naugatuck Valley brass and copper business is a plate or sheet mill. Our second picture shows the mill building, and at the present time the installation of the machinery is under way. This building runs parallel to the river, and the tracks of the New York Central Railroad, and is 600 feet long by 165 feet wide. The building is served with two overhead cranes and six muffle or annealing furnaces, furnished by the W. S. Rockwell Company, New York. At

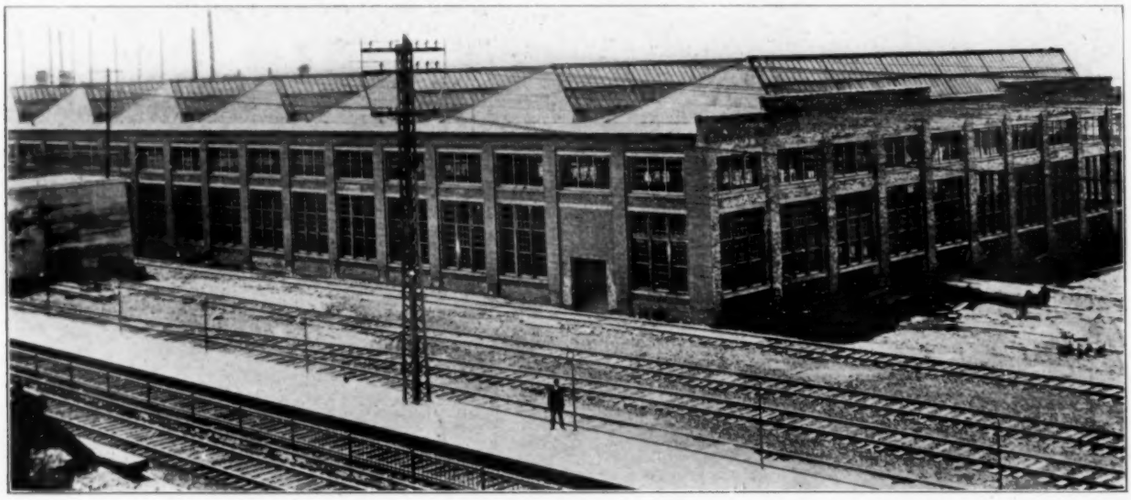


FIG. 2. THE NEW SHEET METAL MILL OF THE NATIONAL BRASS AND COPPER TUBE COMPANY AT HASTINGS-ON-THE-HUDSON. THE BRASS FOUNDRY IS TO THE LEFT OF THIS BUILDING.

present there are eight pairs of rolls being installed by the Ansonia Farrel Foundry & Machine Company, Ansonia, Conn., but provisions, it is said, have been made for upwards of thirty, with the necessary slitters, drying out, and overhauling machines, together with shears and other necessary machinery.

The officers of the company are: E. S. Perot, president; Cornelius Gallagher, vice-president; Geo. J. Jackson, treasurer and secretary; C. S. Morse, consulting engineer. The above are located at the New York office, 41 Park Row, with a Western office in the Rookery, Chicago, Ill. At the plant in Hastings are W. H. Lewis, general superintendent; L. D. Van Aken, a former Waterbury man, who is now in charge of the mills, and Dr. R. T. Roberts, the chemist and metallurgist, who was formerly first assistant to W. H. Bassett, metallurgist and assistant superintendent of the American Brass Company, Waterbury, Conn.

THE INFLUENCE OF STYLE ON THE ART METAL WORK OF MODERN TIMES

By A. F. Saunders.*

(Second paper, continued from January.)

Next in order we find the Indian ornament. The civilization of India dates back to a very remote age, but up until the era of Buddism, which became the state religion about the year 256 B. C., practically nothing is known of the art of the ancient races of people that formed the vast kingdom of India. Indian ornament possesses many characteristics of Persian origin, but later on we find a strong Grecian influence all through its composition. After the spread of Islamism became general it took a new direction based on Arabian art; it, therefore, would perhaps be more comprehensive to treat this part of the subject when dealing with the art of the so-called Islam series to follow.

We now come to the most aesthetic of period styles, "Greek ornament." It is the very foundation of all European art. It forms the first great division of what may be called the European styles, which includes the Greek, Etruscan, Roman, Pompeian, Byzantine, Gothic and the Renaissance, up to the new art movement of the present century. Greek art was a development of Egyptian, Assyrian, and Phoenician, transfused by a new spirit—the spirit of liberty—from Asiatic despotism, and a complete rejection of symbolic or narrative forms in decorative art; substituting forms wholly aesthetic. While this principle is the direct outgrowth of symbolism and realism, an aesthetic ornament is an arrangement of form, decoration and color which eminently pleases the eye by reason of its adaptability to the position it occupies, and also by reason of its grace of form. This charming quality in Grecian art was the direct outcome of an intense and careful study of nature, and where a symbolic meaning was attached to the ornament, it was rather to the object as a whole.

The national character of the Greeks was very different from that of the Egyptians or the Assyrians. The cold severity peculiar to the art of these nations was antagonistic to the sense of beauty so characteristic of the Greeks. They soon changed the standard of Egyptian form into one more pleasing and agreeable. Although all different periods of Grecian construction rose always together, nevertheless the general use and development of each separate style enables a chronological division to be made. The four epochs were: The Mythical Period or Heroic epoch, which covered that prehistoric era when stone and copper predominated, and also the Bronze Age of the Mycoenean epoch. The Ayrians designated by the general title of Pelasgians were the original inhabitants of ancient Greece, and the principal art centres of this period was found on the coasts and islands of the Agean Sea. The Doric or Archaean Period began with the entrance and permanent residence of the Hellenes, who at that time changed the form of government from that of a monarchy to a republic. The mythology which arose at this period enkindled the spirit of art and gave it that ideal character which afterwards distinguished it so strongly. These Hellenes brought with them into the country their own peculiar art style, which they further developed by combining it consistently with the Mythical art existing at that time, also by making new use of Egyptian and Assyrian influences. The development of the Doric and Ionic orders reached their most perfect form during this period. The first order excelled in elegance, the latter in manly strength, a third the Corinthian order, developed into perfection along with the Doric and Ionic, though it was not so binding in its rules, allowing more play to the artist's fancy.

The fourth or Hellenic Period, from about 338 to 146 B. C., saw the rise of the Corinthian style, which con-

PLATE 4. EXAMPLES OF GREEK ORNAMENT.

No. 1. Doric foil, egg and dart. No. 2. Fragment from monument of Lysikrates, Athens (Greek scroll form). No. 3. Greek Ante-fix, Palmate form. No. 4. Decorated Greek Hydra (Corinthian period). No. 5. Bronze leg (Athens). No. 6. Greek treatment of Acanthus Leaf. No. 7. Greek Key or Fret Border.

*Designer, Benedict Manufacturing Company, East Syracuse, N. Y.

tinued up to the destruction of Corinth. This marked the downfall of Greek independence, resulting in the complete union of Grecian and Roman art. In Greek art we have for the first time in history a complete fulfillment of the laws or principles of ornamentation. These are termed Complications, Confusion, Eurythmy, Repetition, Alternation and Intersection (the definition of these principles I shall explain in a later article). Its greatest charm is its simplicity and decorative quality, it is never representative or allegorical, and although strongly influenced by religion, yet we find that the Greek style decorates and glorifies its religious observances rather than to symbolize them. The several illustration herewith will give some idea of the character of the style. On plate four, No. 1 shows the so-called Egg and Dart motif used as a molding or foil. No. 2, a characteristic scroll form. No. 3, Antefix, Palmate, a motif developed during the Doric period and of Assyrian origin, based on the principle of radiation. No. 4 illustrates an example of Greek decoration as applied to form No. 5, a combination of the Palmate motif and an animal's foot used as a leg of chair. No. 6, Greek treatment of the Acanthus leaf. No. 7, Greek key or fret border.

Contemporaneous with the development of the several Greek Periods we find the so-called Etruscan ornament. Etruscan was the name given to a people who inhabited ancient Etruria, the present Tuscany. Although their decorative art shows decided traces of Greek influence, nevertheless it is impossible to regard them of Greek origin, their art was especially subject to the influence of the Ionic, but changed in such a way as to give it an individual character of its own. It reached such a high state of development that at the period of their subjugation by the Romans, Etruscan art was able to exercise an exceedingly strong influence upon the future development of Roman art then in its infancy. Roman art afterward became entirely under the influence of Greek art, thus Roman ornament divides itself into two almost distinct periods. This fact is noticeable in both the architecture and decorative art of the ancient Romans.

At the beginning of Roman history the people were too busy increasing their empire and amassing wealth to develop an individual style of their own. They were content to boldly copy motifs from the decorative art of the Etruscans and the Greeks, eventually they began gradually to develop a national art of their own. The manner in which their artists employed great masses of ornament was most detrimental to the characteristic good outline of form used by the Greeks, and finally destroying completely the charming quality of complete harmony found always in Grecian art. Illustrations of Roman decorative motifs in Plate 5 give one a more comprehensive idea of the principal characteristics of this highly ornamental style. The fall of Rome and the victory of Christianity marked also the decline of what we call Classic Art. From the ruins rose the so-called early Christian or Byzantine style and from a further development, the Romanesque. These form the nucleus of the various period styles of the Middle Ages, thus in the next article we begin with the first of the Romantic styles, that of the Byzantines.

(To be continued.)

PLATE 5. EXAMPLES OF ROMAN ORNAMENT.

No. 8. Bronze foot, part of triped (Rome). No. 9. Roman silver bowl (Hildesheim). No. 10. Roman silver bowl (Hildesheim). No. 11. Festoon from capital in Temple of Vesta at Tivoli. No. 12. Roman bronze lamp. No. 13. Fragment of a frieze in alto-relief (Rome).

GERMAN METHODS OF MANUFACTURING BRONZE POWDER

The raw materials used in the manufacture of the better grade of bronze powder are copper and zinc. For cheaper grades various kinds of metal scraps from the toy and other factories are mixed with these two basic metals.

The metals, mixed in graphite crucibles, are placed in furnaces, where they are reduced to a molten mass in about five hours and then poured into molds and cast into half-round ingots about 12 inches in length and about five-eighths of an inch in thickness. The ingots are flattened under water-power hammers and passed through rollers under great pressure until they are extended into metal ribbons many yards in length. Before becoming so brittle as to break, these ribbons are annealed in a furnace which is fired only with wood. They are then cut into strips about two yards long, tied into bundles of approximately 100 each, and hammered out still thinner. After being subjected to another annealing process two or three of such bundles are tied together and again hammered. At this stage the thin metal sheets are put through a cleaning process, tied into still larger bundles, and again beaten out under hammer. When the required thinness is secured the sheets are cut and torn into shreds and placed into hermetically closed iron boxes, in which they are pounded into a powder under vertical iron stamps. They are passed from one stamp mill to another until reduced to the fine metallic flour known as bronze powder.

ENGINEERING ECONOMIES IN THE MANUFACTURE OF BRASS.

By Guion Thompson.

In the steel and textile mills today the economical production of the article manufactured is well developed, carefully studied and constantly improved. In mills engaged in the manufacture of brass and copper very little development has as yet been made in manufacturing economy, and thousands of dollars are being thrown away continuously in wasteful and crude manufacturing methods; relics of the past. Why this is so is not clear, as the manufacture of brass and copper offers many possibilities in the way of automatic production. Roll speeds are constant and the handling of the material is consecutive and regular. Instead of innumerable men pushing hand carts about the mills to convey the metal from rolls to furnace and furnace to rolls; instead of taking the metal piece by piece and feeding it to the rolls by hand and then piece by piece loading it on carts again to be pushed to the furnace and again handled piece by piece to the furnace pans and so on, it would be a comparatively simple process to feed it automatically and continuously to the rolls from which it would be carried back to the furnace without manual handling at all. The rolls would then be working continuously, and in some cases with 50 per cent. of the present cost of labor would probably handle twice the amount of metal. There are many able men today devoting their time to economy in the production, transmission and application of power used in the brass mills, but the cost of power is small as compared to the cost of labor. A sacrifice of 25 per cent. in the efficiency of the power equipment may not mean as much as a 2 per cent. loss on the total cost of production, while the saving on the labor of 30 per cent. may mean a 25 per cent. saving on the total cost of production.

The economy of the steam engine in driving a train of rolls is far above that of several motors driving the same train divided into small groups, compared on a basis of power delivered at the rolls per pound of coal fired, but the breaking of one roll in the first case may cost, in idle labor, ten times as much as the idle labor of a broken roll in the second case added to the excess in cost of the power used under the less efficient method of divided electric drive. In one case practically the whole mill shuts down and the hands stand idle—in the other only a few stands shut down and only a few hands stand idle. The difference in excess of cost of power transmission is totally lost, as compared to the saving on the idle labor. Power generated by several units and delivered by several motors is less efficient than power generated by one unit and delivered direct, but the loss in power efficiency is a small price to pay for gain in production efficiency of which that power is a small part. Although it is a small part of the production cost, it is an absolutely necessary one during working hours, and to provide against its failure or to reduce the extent or cost of any failure is worth many times any improvement in the efficiency of the generation and transmission of the power alone. In fact, improvement in the efficiency of the power plant may often increase the cost of production of the manufactured article where the proportion of cost of labor is great as compared to the cost of power. Where the cost of labor becomes a small item, the power economy becomes of more importance.

And, when treating the power end of the question engineers should consider production of the manufactured article per pound of coal, rather than power delivered to the manufacturing machine per pound of coal. Many statements are made that in the manufacture of brass and copper it is not possible to introduce mechanical methods as freely as in the manufacture of some other product such as steel, this may be true, but there is no reason at all why about 50 per cent. of the manual handling of metal in sheet, rod and tube mills as at present operated in the majority of cases cannot be completely abolished. The idea that in the production of brass the methods vary so much and are so special in various cases as to make it impractical to introduce mechanical means of handling, is a narrow one, lacking in perspective, and is probably born of a too close application to the grindstone by those who take this view. In general, and as a basis on which to work out an operating schedule, the following tentative suggestion is made: Deliver the cast metal by cranes directly on feeding tables, from which it is automatically and continuously fed to the overhauling machines (if such are used), these machines delivering the metal directly and continuously to the rolls, from which it is automatically conveyed and loaded on the muffle pans, the loaded pans being carried by cranes to the muffles. Annealed metal to be taken by cranes from the muffles to a cooling floor. From the cooling floor the metal to proceed continuously by automatic conveyors through pickles, washers, driers, to rolls and muffle pans. Coiled metal to be uncoiled when leaving the cooling floor and proceed in a continuous length to the rolls, coilers and pan loaders.

When tubes are the product they may proceed automatically from muffle to pickle and wash tubs, pointers, etc., to a bench supply. When drawn, the bench can deliver the tube to a conveyor, taking them to the muffle, or load them on muffle pans to be removed to muffles by crane. The wages paid machinery is the purchase and maintenance cost thereof. That amount, distributed over the production of the machinery during its life gives the cost per unit of the manufactured article. Therefore, accidental shut-down of the machinery does not mean a large cash payment without return, as in the case of idle labor. A machine will turn out product at so much per unit every day for one year or every other day for two years, but labor producing an article will make it cost so much per unit when turning out a given quantity per unit time or make it cost twice as much per unit when turning out only half the quantity in the same time.

It may be said that, if satisfactory profits can be made under crude and costly methods of manufacture, why change? Why not wait until it becomes absolutely necessary to change in order to meet competition, etc. To make such changes, to utilize every possible improvement, to use every conceivable means to cut down production cost, is to be prepared to keep ahead of competition, to be the winning competitor, to increase profits and to be prepared to better withstand poor business conditions. The economy of power generation and transmission is a very important question, but the economy of the production of the manufactured article is more important, and the engineer who throws away a thousand dollars in the first case in order to save two thousand in the second, is accomplishing profitable results, while he who may be making wonderful savings in the first case may not be effecting the overall profits enough to warrant the inconvenience and expense connected with his improvements. It may not be his business to consider the small efficiency; perhaps this question belongs to the managing department; but wherever it belongs, the question is one of great possibilities, and the proportion of cost of power to cost of labor should be such that the labor cost is comparatively small in order that the whole cost of manufacture may be better controlled and become a more stable and concrete question.

COPPER AND ITS ALLOYS IN EARLY TIMES*

By William Gowland, Assoc. R. S. M., F. R. S.

(Continued from March.)

Implements and weapons of bronze, unlike those of copper, were always cast in closed molds. The method of melting the metal in each case was as follows: The furnace or hearth was merely a shallow depression in the ground. The crucibles were made of clay, which was sometimes mixed with finely cut straw or grass. They were embedded in the ashes at the bottom of the hearth in such a manner that their faces and sides were thoroughly protected from the intense heat of the fire, their upper edges and interior only being exposed. This method had been adopted owing to the fusible character of the clay of which they were made. The fuel used was wood and the charcoal which was produced during the process. After a crucible had been thus placed and charged with copper, copper and tin-stone, or copper and tin, the fire was made up over it. A sufficiently high temperature for melting the metal could be obtained by the wind alone. When the contents of the crucible had melted, the crucible was removed from the furnace and the metal poured into a mold.

In consequence of this mode of heating, the lower parts of the crucible will, it is evident, bear but little traces of the action of a high temperature, while the upper

FIG. 2. STONE MOLD FOUND AT EL ARGAR.

edges and interior will exhibit a fused or semi-fused structure, and this is precisely what we find in all early crucibles.

Some of the most important types of crucibles are illustrated in Fig. 3.

The small capacity of by far the greater number of these crucibles which have been found is worthy of note. Few can have held more metal than would suffice for the casting of a single axe. This is, however, not surprising, if we remember that they are the appliances of that remote time when metallic weapons were only beginning to replace those of stone.

The clay vessel (No. 1) was found among the debris of pile dwellings in Carniola. It is open to doubt whether it is a crucible or not.

No. 2 is a common form widely distributed in the remains representing the early Bronze Age in the pile dwellings of Switzerland, the Danubian basin, and Ireland. It is furnished with a socket for the insertion of a stick, by which it was removed from the fire and its contents poured into a mold.

No. 3, a shallow oval dish of somewhat rare occurrence, found in the Mond See. They can hardly have been used for making castings; it is, however, just possible that they were employed in a rude refining process, by which part of the impurities in the crude copper obtained by smelting were removed by allowing the air to act on the surface of the metal; or, it may be, they are the vessels in which the founder first made his alloy, in order to test its properties, before making the actual casting of a weapon.

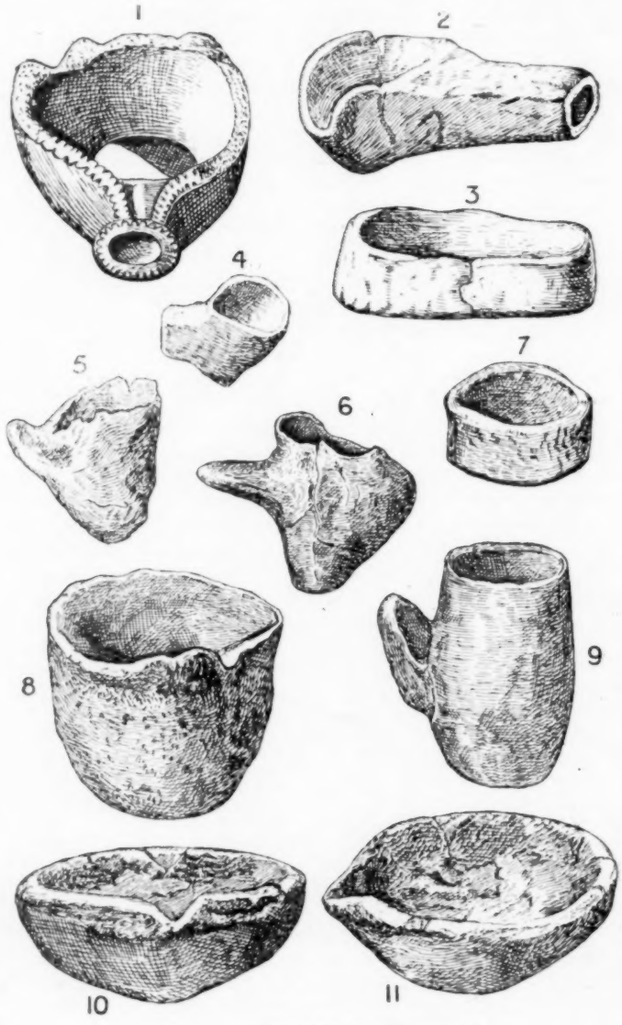


FIG. 3. PREHISTORIC CRUCIBLES.

No 4 was found in the remains of a crannog in Lough Mourne, Ireland.

Nos. 5, 6, 7, 8, 9 represent crucibles found at Dunadd, Argyll, together with iron spear-heads and other iron objects.

Nos. 10 and 11 were found together with copper and bronze implements and stone molds in Mercia and Almeria, in the southeast of Spain.

*Presidential address, January meeting of Institute of Metals, London, England.

The molds used by primitive man are also of considerable interest. The earliest are of the class known as open molds, and consist merely of cavities of the necessary form and size hollowed in the surface of a stone. Of these, Fig. 2 is a characteristic example.

Plate II, Nos. 1 to 5, represent copper celts cast in these molds. Similar molds of clay were also used, but owing to their perishability few have been found.

The molds of the later Bronze Age were either of clay or bronze. An excellent example of one of bronze is shown in Fig. 4. It was used with a core, and differs but little from molds of the present day.

In casting swords and daggers of bronze the molds must have been of clay and been heated to dull redness at the time when the metal was poured in—a method of casting which is still practised in Japan, and which I described in my May lecture—as by no other means could such perfect castings of their thin blades have been obtained. The castings generally were hammered at the cutting edges, and it is to this hammering, and to it only, that the hardness of the cutting edges of both copper and bronze weapons is due, and not to any method of tempering. Much has been written about the so-called art of tempering bronze, supposed to have been practised by the men of the Bronze Age in the manufacture of their weapons; the hardness is also said to be greater than can be given to bronze at the present day. I should like to correct this error, as it could only have arisen owing to its authors never having made any comparative practical tests of the hardness of bronze. Had they done so, they would have found that the ordinary bronze of today can be made as hard as any, in fact, harder than most, of prehistoric times, by simple hammering alone.

COPPER ALLOYS OF LATER TIMES.

We will now pass to the consideration of the copper alloys of Mycenæan, Babylonian, Greek, and Roman times. Until the introduction of iron, copper and bronze played an important part in the lives and struggles of the early races, occupying the Greek peninsula and its islands, while in later times the alloy bronze afforded an imperishable material to the great sculptors of the golden age of Greece, by which many of their incomparable works have been preserved to us.

In Greek literature we have no records of metallurgical processes relating to copper or its alloys, such as are to be found in the writings of Roman authors, notably Pliny.

Strabo, the only Greek author who condescends to take any notice of metallurgy or metal working, confines his statements to gold, silver, and lead. But at Laurion the remains of ancient furnaces for smelting lead ores, which have been unearthed from time to time, indicate that low hearths resembling those of the Bronze Age were extensively employed; and if we may reason from Japanese metallurgical procedure, similar furnaces would be used for copper. The island of Cyprus, once rich in copper ores, was doubtless the source whence the inhabitants of the Greek peninsula in early times obtained their copper.

Among the earliest specimens of the metal which have been found in Greece are some copper nails which were obtained by Dr. Schliemann at Orchomenos, a city in Bœotia, which was in a state of decay in the time of Homer. They belong to that remote period in Mediterranean civilization to which the name Mycenæan has been applied.

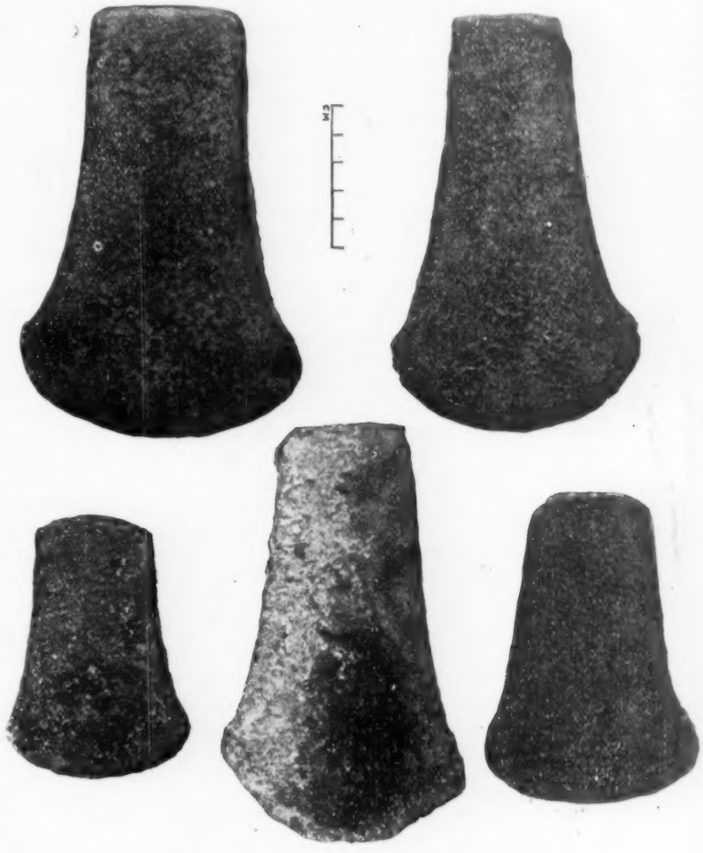
One of these analyzed by Rammelsberg had the following composition:

Copper, per cent.	Lead, per cent.	Iron, per cent.
99.53	0.27	0.20

Two very large nails of about the same date, one weighing 2½ lbs., which were found by Schliemann with some carbonized beams in his excavations in the second city on the site of Troy, were analyzed by Schröter with the following results:

Copper, per cent.	Iron, per cent.	Tin, per cent.
99.55	....	....
98.65	0.85	0.45

They are interesting as showing that the men of that remote period were able to produce copper of tolerable purity, but this would not be difficult, as the ores which they worked would be oxidized ores, oxides, and carbonates from the outcrops of veins, viz., the parts which were exposed at the surface of the ground.



COPPER CELTS. (BRITISH MUSEUM.)

Bronze was also then in use for nails and cramps in building construction, but especially for weapons, and was of good quality, one of the weapons consisting of copper, 90.76 per cent.; tin, 8.42 per cent.; lead, 0.32 per cent.; iron, 0.54 per cent.

There is abundant evidence to show that Egypt was the first in the field in artistic bronze casting. When it first began it is difficult to say, but objects of at least as early as 3000 B. C. are in existence.

Even in the early examples great technical skill is displayed. The most ancient Greek bronzes are solid castings, whereas in Egypt they are light and hollow, having been cast with a core of argillaceous sand, which still remains in many specimens.

The statuary bronze frequently contains considerable amounts of lead, sometimes with but little tin, and the

question naturally suggests itself, whether this arose from scarcity of the latter metal. Only a few analyses have been made, and unfortunately few of the objects can have even approximate dates assigned to them.

Bronze was in extensive use in Nineveh about 1000 B. C. for vessels and utensils of many kinds, and curiously was sometimes employed for those which we should now make of more precious metals.

In the British Museum there is a large collection of these objects which were obtained by Mr. Layard in his excavations in the ruined city.

	Copper, per cent	Tin, per cent,	Lead, per cent.	Iron, per cent.	Zinc, per cent.	Nickel, per cent.	Antimony, per cent.	Arsenic, per cent.	
Ancient statuette with core inside.....	85.06	2.75	10.89	0.71	...	0.40	0.37	....	Fellenberg.
Fragment of a great statue.....	81.22	2.51	16.00	Trace	...	0.25	0.02	....	Bibra.
Statuette Osiris (300 to 200 B.C.), with core	76.83	11.23	11.70	Trace	...	....	0.13	0.11	"
Plate from a mummy case (300 to 200 B.C.)	75.24	13.15	11.40	Trace	...	0.21	....	....	"

Several have been analyzed by Fellenberg, of which the following are representative:

	Copper, per cent.	Tin, per cent.	Lead, per cent.	Iron, per cent.	Anti-mony, per cent.	Arse-nic, per cent.	Nickel, per cent.
Small rod.	86.84	12.70	0.28	Trace	..	..	0.18
" cup.	80.84	18.37	0.43	0.16	..	..	0.20

In three other articles analyzed by Phillips in Dr. Percy's laboratory the tin ranged from 9.8 to 11.33 per cent. All the above are true copper-tin bronzes with only traces of lead.

In one of the objects analyzed by Phillips, one of the feet of a tripod, the bronze had been cast over an iron core. This appears to have been a common practice in Nineveh for rods, handles, etc., not because iron was cheaper than bronze, but for constructional reasons, the iron being relied on to give strength, while the bronze was pleasing to the eye, and could be easily decorated.

The bells found have 14 per cent. of tin, showing that the Assyrians were well aware of the effect produced by changing the proportions of the metals.

The Greek copper alloys of a later period, many examples of which are found in the coins of about the fourth century B. C., are true bronzes consisting of copper and tin, with lead or zinc only as impurities and not intentionally added.

A curious feature in them is the presence of nickel varying from traces up to 0.5 per cent. The percentage of tin is somewhat irregular, but in most examples ranges from about 8 to 11 per cent. The same is true of the Macedonian coinage alloys from the third to the second century B. C., but the percentage of tin in them is somewhat greater, generally being from about 10 to 12 per cent. These alloys were undoubtedly made by melting together the metals copper and tin, and not, as in the bronze age, by smelting stanniferous copper ores, or by melting copper with tin ore.

The Macedonian alloys more particularly, as will be seen from the following analyses of typical coins by Bibra, are the best of the ancient bronzes:

Copper, per cent.	Tin, per cent.	Lead, per cent.	Iron, per cent.	Anti-mony, per cent.	Nickel, per cent.	Sulphur, per cent.
87.72	11.70	Trace	0.27	Trace	0.38	....
88.56	10.31	0.73	Trace	Nil	0.40	Trace

A little later in Greek coins we find lead as an intentional constituent in various proportions, ranging generally from about 6 to 10 per cent., or even more, with a proportionate reduction in the percentage of tin. The Macedonian coins, however, with few exceptions, preserve their character as true bronzes.

The alloys used for statues are frequently true bronze with 9 to 11 per cent. of tin, but in other examples about 5 per cent. of lead has been added, probably with the intention of increasing the fusibility of the alloy and its fluidity when molten.

The statements of Pliny as to the composition and mode of manufacture of the bronzes as imitated in Rome throw but little or no light on the subject; in fact, they are for the most part useless and misleading. As regards the Corinthian bronze, the beauty of which is so extolled by classical writers, he states that the alloy was discovered by the Romans at the sack of Corinth, when vessels of gold, silver and bronze had been accidentally melted together during the burning of the city and produced a golden bronze.

The siege of Corinth, however, occurred in 146 B. C., but the excellence of Corinthian bronze had been recognized long before.

Whatever may have been the exact composition of this bronze, of which several statues are said to have been cast, I may say that no addition of gold or silver to any copper-tin alloy will cause it to closely resemble gold. Imagination must, I think, be responsible for the accounts given of this bronze by ancient authors, especially when we read also that its beauty was derived from being cooled in the water of the fountain of Peirene.

Unfortunately but few analyses have been made of Greek bronzes. The following are the only representative analyses I can find:

	Copper per cent.	Tin, per cent.	Lead, per cent.	Zinc, per cent.	Iron, per cent.	Nickel, per cent.	Sulphur, per cent.	
1. Statue in the Art Museums, Dorpat.....	88.54	11.46	...	...	...	...	...	Gobel.
2. Statuette	88.51	10.13	...	...	1.02	0.34	Trace	Bibra.
3. "	80.91	10.13	5.25	0.31	...	0.12	"	"
4. "	89.96	9.22	...	...	0.44	0.38	...	"
Fragment of drapery, fifth century B.C.....	84.49	9.47	5.31	...	Trace	...	...	Wingham.
Statue of Dionysus, Græco-Roman period.....	85.05	10.35	4.65	...	Trace	...	...	"
Statue from Ephesus, fourth century B.C.....	89.04	6.09	4.87	...	...	...	...	Natterer
Vase, 336 to 324 B.C.....	81.76	10.90	5.25	...	0.15	Cobalt 1.22	...	Flight
Bowl from Roman settlement in Nubia.....	80.81	13.08	5.14	...	0.29	Ni & Co. 0.46	...	Gowland.

With the fall of Greece and the rise of the supremacy of Rome we enter an important period in the history of copper and its alloys. In Spain and in Britain we find copper smelting being vigorously carried on by the Romans.

(To be continued.)

PIERCING DIES

A Series of Articles Describing the Manufacture of Various Kinds of Dies—The First Article Appeared in March, 1912.

By Easy Way.

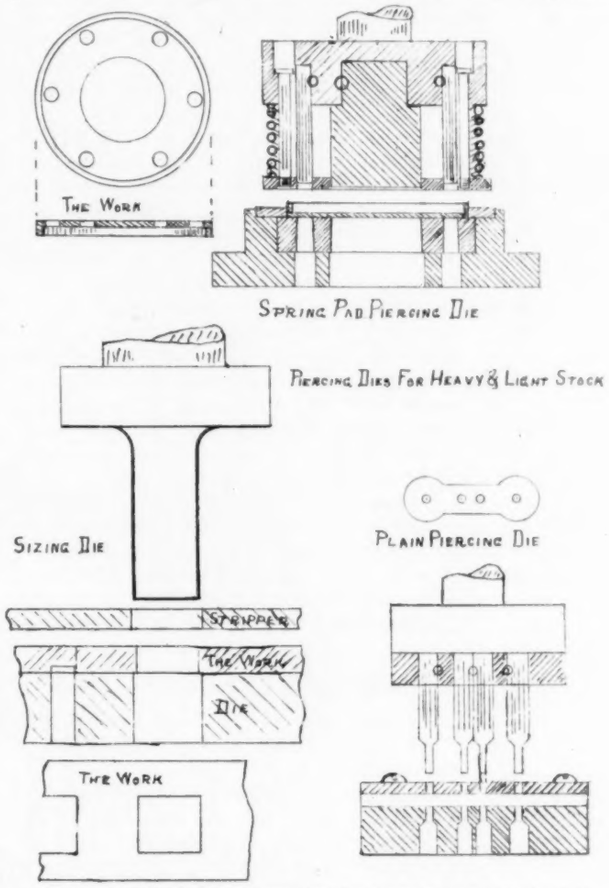
Plain and Multiple.

Piercing dies are known in types as plain and multiple. Some have the stripper arranged on the die and are stationary. Others are on the punch, actuated up and down by spring or rubber pressure. In this way the piercing punch can be made very short and more substantial. For should the stripper be arranged on a die used to pierce a hole in the center of a drawn cup, imagine the elevation of the die above the bolster, then add the height of the cup plus clearance between the top of the die and the under side of the stripper plate for in and out convenience, to this then add the thickness of the stripper plate, and from its construction a very unsightly and cumbersome outfit has been made to produce a simple job of piercing. However, this is practiced by many today, and the following will convince them of its folly. Because the height of the cup, the in and out clearance, the thickness of the stripper, the space between the top of the stripper plate and punch holder, and a reasonable length for wear on the punch must be taken into consideration, and is necessary with this style of type. The only way to avoid these conditions are: make the stripper to work up and down on the punch, and this at the same time will steady the punch action.

The last referred to plan is also very satisfactory for the multiple type. As all the punches work through the stripper plate and this in turn is controlled by shoulder pilots stationed on the punch holder which enter the die and avoid any shearing of the punches and checking of the die cutting edge, the stripper plate can be governed by coil springs or rubber. The location of the work to be pierced on the die is arranged by a set gauge which with this type of die is commonly called a "Nest." Into this the work is placed for the operation. These nests are usually made so that their contour is the same as the work, but relieved at a few points to avoid clogging, and it is easy to place and remove the product from the die. This type of nest should be somewhat thinner than the material operated on, then the stripper pressure while piercing will prevent distorting the shape of the work and supply a product that is satisfactory. In building a multiple piercing die that requires a number of holes or staggered shapes of the required size, a cast iron block should be planed all over and laid off, then in this steel inserts are located for the dies.

Whenever convenient always use the round type with one degree taper, as it holds better and can not shift sideways and shear the punch. By using the inserts the difficulty is obviated of hardening the whole construction, also permitting a quick repair in case of any damage by inserting a new "bushing" or die and thus saving time and expense. Apparently a very simple piercing die to make is a series of holes along a straight line to the quantity of say thirty holes exactly ⅛ inch in diameter and ¼ inch apart, but should the inexperienced endeavor to accomplish this feat with spacing and drilling they would meet with a direful disappointment. Because any one that can produce satisfactory results in this manner is more than human, and is losing time staying around a die shop; and the writer has seen some of our worthy experts go to pieces on this same undertaking. The only way to produce a die to meet these requirements accurately is, as has been explained, by the method of inserts and the following construction

First the insert dies or bushings will be considered, then the die holder and then the punch. As the holes required are ⅛ inch in diameter, and the spacing ¼ inch apart, this naturally governs the diameter of the inserts, which must be ¼ inch diameter and straight, and also of a determined length to suit conditions. As an example: Then to produce this 30 hole die, take a piece of Stubbs rod and rough turn the outside in a bench lathe, finish drill and taper ream the hole for the ⅛ inch diameter, then cut from the rod the required length, say ⅝ inch, and the first die is now ready to harden. It is best to proceed further and make the whole amount required



VARIOUS TYPES OF PLAIN AND MULTIPLE PIERCING DIES.

before hardening. After hardening and tempering the outside diameter of each die must be ground exactly .250 diameter, then the ends may be finished for length, but do not ever allow more than .005 inch as this is sufficient to remove the roughness from the cutting off tool. After the dies are all ground, start the die holder and make this of cast iron. The top and bottom faces only require finishing, then in the center of the entire length of the block plane or mill a slot .250 inch wide and 9-16 inch deep and in this slot station your thirty dies with suitable abutments at the ends of the block to prevent the dies from separating. Now, hold them down with a strip of metal overlapping the edge of the dies a trifle, and fasten this with screws. After this the location of the punches in the holder can be transferred through the die by drilling, or use the same plan of die construction

if you choose, but the punches would have to be made with a body of ¼ inch diameter to obtain the proper spacing. The stripper is arranged on the punch holder and the shedder material is of rubber or coil springs. By this construction a very difficult and stubborn proposition is accomplished without any confusion in an easy way. With the assurance that the dies are all .250 outside diameter and they surely fit the milled slot of .250 diameter the product produced from it cannot reasonably be anything but perfect for alignment and distance apart.

POLISHING ALUMINUM COOKING UTENSILS

By T. C. Eichstaedt.

As I have been asked, from time to time, questions relating to the polishing and buffing of aluminum, I have incorporated some data on the subject in this short article which may prove interesting. The gist of the matter may be expressed in the answers to the following questions:

1. What is the method of polishing and buffing aluminum cooking utensils?
2. What kind of abrasive is used and on what kind of a wheel is it used and how is it applied to the wheel?
3. What kind of a machine are the wheels mounted on?
4. What kind of buffing compound is used and on what kind of a wheel?

If the utensils are sheet metal and not rough, that is, if they are not pitted too deeply and contain no deep spinning or turning marks, they are simply cut down on a buff, and colored on another buff. But if they are made from castings they should be polished before buffing, on polishing wheels, set up in emery generally on two wheels either No. 80 to 90 emery and then No. 120. Use plenty of grease, preferably tallow, although tripoli or oil will do, should you not have the tallow. This is applied to the wheel while in motion, and if the cooking utensils are of sheet metal and are pitted or have deep turning marks, then run them over one polishing wheel. The No. 120 will do for this and then buff them.

The abrasives used are either emery, corundum, alundum or carborundum, preferably the first, and it is applied to the wheel with glue. The kind of wheel to use depends on the shape of the article to be buffed. A hard wheel should be used on flat work where a flat surface is to be maintained. For round or oval shapes use medium soft wheels. There are many wheels on the market, such as Universal polishing wheels, compress canvas and canvas wheels. The writer prefers the Universal wheel for oval or round surfaced work, and medium for flat surfaced work. The wheels are mounted on a regular polishing machine, such as is used in any up-to-date polishing room at a speed of about 1900 to 2000 revolutions per minute.

The most greasy tripoli that can be obtained is the best buffing compound to use. Use the best quality and apply a little oil with it. This can be done by having a small dish with waste in it soaked with oil and dipping the tripoli into it before applying to the wheels. Use a one piece unbleached muslin buff, fourteen inches in diameter, the width will depend on the shape and style of work. A two-inch face is usually used for a general run of work. It is very essential to keep the wheel well filled with tripoli and also to rake out the wheel occasionally when the face becomes caked or hard, as it then drags the work and also leaves marks of the wheel on it. After the work is cut down, if it is very greasy it should be washed in gasoline or benzine and then colored on a smaller wheel; one that has been worn down or formerly used for a cutting down wheel will do. If you do not have any such wheels it might be well to buy some. Small unbleached muslin buffs, about ten inches in diameter, may be used for this purpose, but as a rule there are generally enough of the buffs that have become too small for cutting down purposes around a buffing room that should be used for this purpose. Use white diamond compound for coloring. A lime composition, such as is used in coloring nickel work, is also very good; in fact, it is preferable to the other.

THE LEAKING OF IRON TANKS USED FOR PLATING

ITS CAUSE AND PREVENTION.

By H. J. Ter Doest.

Iron tanks used for plating generally contain cyanide or other alkaline solutions, which are not supposed to affect them. That this is a mistake is generally known by the plating trade. When more current is forced through the solution than it will carry, part of it is diverted through the tank itself, which causes it to oxidize at the point where the current leaves the tank, and in due course causes it to leak. Figures 1 and 2 show how this takes place: Fig. 1 is looking at the tank from the top and Fig. 2 is looking at it from the end. The arrows show the path of current from anode to tank and from tank to work. If this current is considerable it will be found, on inspection, that the tank immediately behind the anode is receiving a deposit and the leaks are nearly always where the current leaves the tank, near the work.

Now, to prevent this oxidation of tank, it must be so insulated that the path of least resistance is directly from the anodes to the work. This is best accomplished by placing a plate of glass at the bottom and ends of tank, taking care to have no open spaces. Joints at the corners of the tank and the bottom glass may be protected by a wooden bottom against breakage, should some work accidentally drop in the tank.

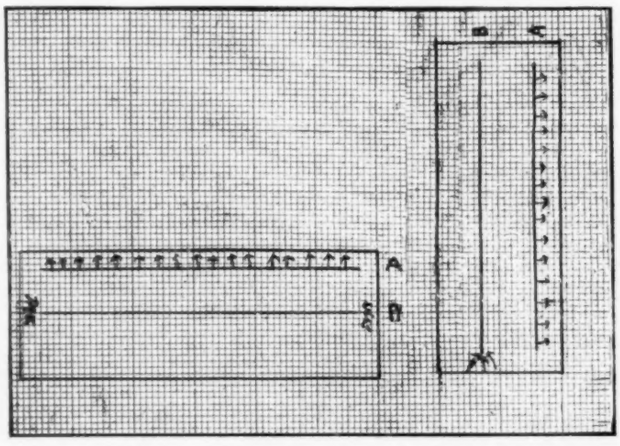


Fig. 1. DIAGRAM SHOWING PATH OF CURRENT IN TANK. Fig. 2.

ADVANTAGES OF STORAGE BATTERIES IN THE ELECTRO-PLATING INDUSTRY

By George M. Howard.*

A paper on this subject was read by Mr. Howard at the banquet of the National Electro-Platers' Association, January, 1911. Since that time the article has been re-written by Mr. Howard, and a description of the action of the storage battery has been added. We republish below a portion of the address, which appears complete in the current quarterly of the Electro-Platers' Association.

The electro-plater utilizes a current of electricity to bring about certain chemical or electro-chemical reactions, which consist in the dissolving of metal from the anode and the depositing of the same metal upon the cathode. In any battery, primary or secondary, the action is the reverse of this. The chemical reactions taking place between the electrolyte and the two electrodes, respectively, cause a difference of electrical potential between the poles, so that when these are connected by a metallic circuit outside of the solution a current of electricity will flow. In a plating bath the anode, or positive pole, is made of the metal to be deposited, and the solution must be so constituted that the anode will dissolve in it only under the action of the current, thus replacing the metal deposited and keeping the bath constant.

Practically all primary batteries have this in common with the plating bath, that one of the electrodes goes into solution. An illustration of this is the zinc in an ordinary Leclanche or a gravity cell. A primary cell when exhausted cannot be restored except by the replacing of the exhausted element—either the solution, or one of the electrodes, as the case may be. To restore a secondary or storage cell, however, it is only necessary to pass through it a current from some outside source in the reverse direction to that given by the cell. One of the chief requisites for this characteristic of reversibility is the comparative insolubility of both electrodes in the solution under all conditions of charge and discharge, and it is in this respect particularly that the storage cell differs from both the primary cell and the plating bath.

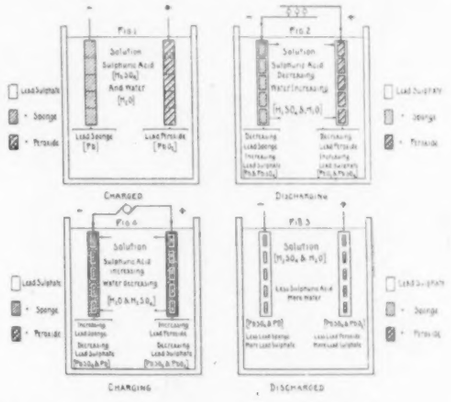
The active elements of a lead storage cell are peroxide of lead for the positive plate and spongy metallic lead for the negative in an electrolyte of dilute sulphuric acid. The "active materials" have to be supported, and the plates are therefore either constructed with grids, which hold the material in place, or else are made with a sufficient core of solid lead to give the necessary strength.

Upon discharge a portion of the lead peroxide and spongy lead unites with sulphuric acid from the electrolyte, forming lead sulphate on both plates. The lead sulphate being practically insoluble, remains on the plates, and is very readily brought back to peroxide and metallic lead respectively upon charging. Thus it is seen that the "storing" consists merely in bringing about certain chemical reactions by means of an electric current, and that the reverse reactions taking place on discharge produce the secondary current.

For practical purposes this can be illustrated in Figs. 1, 2, 3 and 4, where the essential elements are represented diagramatically. In the charged battery (Fig. 1) the material, peroxide of lead (PbO_2), supported on a lead conducting frame, is the positive electrode; sponge lead (Pb), supported on a conducting frame, is the negative electrode and dilute sulphuric acid (H_2SO_4) is the electrolyte or solution in which the plates are immersed.

When the circuit is completed by turning on lamps (Fig. 2), current flows from the positive plate through the lamps into the negative plate, through the electrolyte to the positive plate. Due to electrolysis, the active material of the positive plate gives up a portion of its oxygen and is converted into lead sulphate ($PbSO_4$). The negative material is also partially converted into lead sulphate, and water is formed from the oxygen of the positive plate and hydrogen of the sulphuric acid.

This action continues until the amount of sulphate formed on both plates cuts off the remaining active material from the action of the current and electrolyte (Fig. 3) to a point where no further useful discharge can be obtained. If the positive and negative terminals of a generator be connected respectively to the positive and negative terminals of the battery, current flows from the gene-



rator into the positive through the electrolyte to the negative plate, back to the generator (Fig. 4). Here the action which takes place is the reverse of discharging. Sulphate from both plates unites with hydrogen from the water to form sulphuric acid, and, as a result, the negative plate is reduced to a lead sponge and the positive plate is oxidized to lead peroxide. At the end of charge the battery is, theoretically, in the same state as at the beginning of discharge shown by Fig. 1.

The above explanation of the action in a lead storage battery is expressed by the equation:

$$Pb + PbO_2 + 2H_2SO_4 \text{ — } 2PbSO_4 + 2H_2O$$

Reading from left to right represents discharging, and from right to left represents charging.

The voltage of the lead storage battery on discharging is considerably higher than that of other cells, either primary or secondary, averaging close to two volts at moderate rates. On the other hand, the very low internal resistance makes it possible to draw very large currents if desired.

Coming now to the application to plating, everyone who has had experience knows how important it is to maintain a constant current in order to secure uniform deposits. Low voltage dynamos, whether shaft or motor driven, are subject to considerable fluctuation. The steady voltage of the lead battery makes it peculiarly suited to maintaining constant current. When batteries are used, not only will the deposit be more uniform than with machine plating, but it becomes possible to regulate the depth of deposit much more accurately by the ampere hours used. An instance of the value of the latter feature is found in the experience of a company doing a very large amount of silver plating. When doing their work from generators there was always an excess of silver deposited owning to the impossibility of accurately controlling the current. They installed large storage batteries,

*Chemist, Electric Storage Battery Company.

and the one item of cutting down the overweight saved enough money to pay for the battery in a year and a half.

In figuring on the proper capacity of battery to install it is advisable to allow a considerable margin. This is not only for the purpose of having a reserve, but also on account of the voltage characteristic. When a fully charged cell is put into discharge the voltage starts considerably above two volts and falls almost immediately to about two volts, where it holds nearly constant until towards the end of the discharge, when it begins to fall more rapidly. Thus it is seen that there is a flat portion of the discharge curve where the voltage is quite constant, and in order to get the full benefit of this in steady output without regulation it is necessary to use batteries of such capacity that they will never be fully discharged.

There are two systems by which storage batteries can be used to advantage. The first is to use them as a regulator for the dynamos, and an auxiliary, so as to permit of a twenty-four-hour working without running the machine constantly. In this system, during the day the battery is connected across the line from the generator to the plating circuits, taking current until it is charged, and then merely "floating," as it is called. While floating, the battery is alternately charging and discharging for short periods as the voltage of the generator varies, and takes the fluctuations which would otherwise affect the working circuits. It is also valuable as a reserve, preventing interruptions in the work in case of a shutdown of the machine for any cause. When the system described above is used it is necessary at intervals of once every two weeks to raise the voltage of the generator and give the battery what is called an "overcharge."

The second method, which is unquestionably better, is to have two batteries used alternately, one charging while the other is discharging, and do all the plating from the batteries alone, using the generator for charging only. This gives all the advantages derived from the constant current and the ability to run uninterruptedly as well.

TRIPOLI AND TRIPOLI COMPOSITIONS

SOME INTERESTING INFORMATION REGARDING THIS MATERIAL SO IMPORTANT IN BUFFING AND POLISHING OPERATIONS.

BY WALTER C. GOLD.*

In the consideration of tripoli and tripoli compositions we will first briefly describe tripoli, and then tell something about its uses. Tripoli is a peculiar porous abrasive—an amorphous silica, its specific gravity is 2.31, and it will absorb almost 60 per cent. of its own weight of water. The finest deposit of tripoli is at Seneca, Missouri, and its origin has been a matter of much speculation. It is supposed to have been a more dense stone from which certain minerals or substances have been extracted through the circulation of water during the past ages. A prominent American geologist and chemist, who examined the deposits of the tripoli beds at Seneca, Missouri, believes that the tripoli was the natural "chert" of that district ("chert" is found in all the lead and zinc mines in that region) and through the action of the water, as before suggested, certain substances were washed out from the chert, leaving a residue which is called tripoli. In substantiation of this theory it may be stated that no fossil remains or shells have been located in the tripoli beds of Seneca; nor can any trace of organic remains be found in the tripoli, even with the use of a microscope. Had this originally been a limestone deposit, fossil and organic remains would probably be encountered. Many balls of solid and semi-solid chert are found imbedded in the tripoli, which further tend to prove that the tripoli is the result of percolation of water and that the entire beds were composed originally of the chert.

The deposits of tripoli are mostly on the flat tops of the hills around Seneca, Missouri, and lie generally where the slope of the hill begins toward the draws and small valleys. The deposits are limited to a very small area in the western part of Newton County, Missouri, and a still smaller one in the adjoining part of Ottawa County, Oklahoma, and are from six to twelve feet under the surface, being covered with the common rock of the country, gravel and a very tough, sticky clay, usually of a deep red color. The strata of tripoli is from six to twelve feet thick and according to the color, there is produced the "White," "Cream" and "Rose" tripoli. In the process of preparation for the market, the tripoli is first thoroughly dried, and then crushed to a size which will readily pass through the grinding mills. From the mills it passes to the bolting cloth, where it is graded according to the fineness desired. For filter-stones, the natural tripoli stone is turned to shape and size on special machines created for the purpose. Many household filters are equipped with these natural tripoli stones.

In the manufacture of tripoli composition, the bond or binding material is stearic acid and several kinds of greases. The powdered tripoli and the binder are thoroughly mixed in steam kettles and then run into molds. It is an indisputable fact that much of the so-called tripoli composition offered manufacturers today contains but a very small percentage of pure tripoli; indurites, silexes, etc., being used as substitutes, owing to the fact that they cost much less than tripoli. Such compounds do not, however, properly combine with the binder, and the consequence is these compositions will not economically adhere to the buff, but fly off and cover the floor beneath the buffing machine. Such composition is low in price, but costly in fact! Some manufacturers add a coloring fluid to these cheap compounds, which gives the article a color closely resembling that of pure tripoli composition. Pure tripoli composition does not compete in price with the adulterated compositions with which the market is floooded, but in quality it is the most rapid cutting, durable and economical. It is an unfortunate fact that very many consumers are buying these adulterated compositions simply because they are low in price; but a better day is at hand, and the marked tendency is to test out the composition for *merit*, and make price a secondary consideration.

*Dealer in polishing compounds.

JEWELRY TRADE WAGES.

Statistics, announced recently by United States Chief Statistician William E. Stewart, of the Bureau of Manufacturers, Washington, D. C., show that in 1910 there was $4,421,000 paid in wages in the jewelry industry in Massachusetts and $1,725,000 in the silverware and plated ware industry. The cost of materials used in the jewelry trade in the State was $5,579,000 and $2,727,000 for the silverware and plated ware. In the total of products, Rhode Island again led Massachusetts in the jewelry industry with a total of $20,685,000 as compared to $15,210,000, but in the value of silverware and plated ware Massachusetts was in the lead with a total of $6,538,000, as compared to $6,198,000 for Rhode Island.

THE CARE AND GRINDING OF THREADING CHASERS FOR BRASS WORK

By P. W. Blair.*

The trouble and time lost by the use of threading chasers which are used to a great extent in the manufacture of brass goods of all kinds is a very important matter and the time has not come yet when the operator of brass working machines can rely on his chasers working satisfactorily at all times. There are many theories and ideas advocated in the manufacture and regrinding of threading chasers that does not always prove satisfactory when put into actual practice. The main feature of getting a threading chaser to work is for the operator to see that the set of chasers fits the die-head properly, as the writer of this article has seen one set of chasers work perfectly in one die-head and change in another, the chasers being inter-changeable in geometric die-heads and they would not work satisfactory, the cause being the variation in the width of the slots in the die-heads, which causes the chasers to tip in the one with the wide slots, thereby changing the relief on the chasers which would not allow them to cut a perfect thread.

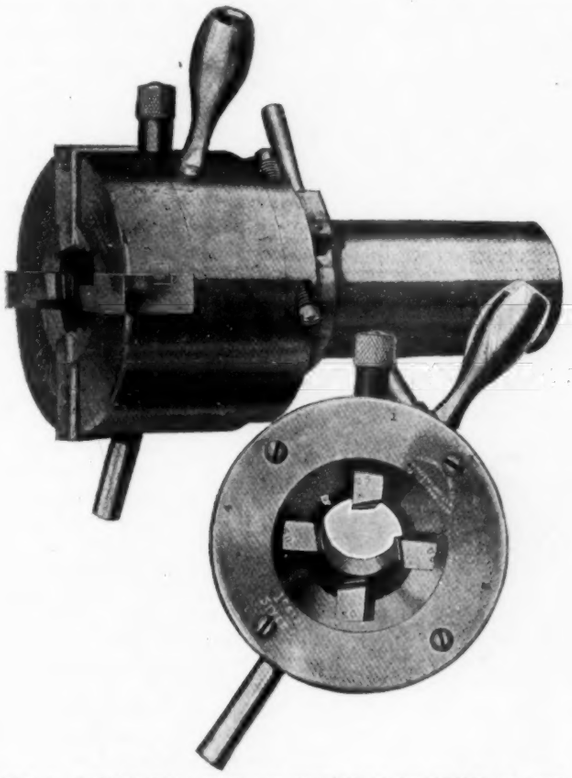


FIG 1. UNIVERSAL TYPE OF DIE HEAD IN GENERAL USE.

When new chasers are made and received from tool tempering department they should be scratch brushed on the thread to remove the scale, and any foreign substance that has accumulated between the threads. Another main point is for the operator to see that the turret of his machine is in line with the work he is threading, so that each chaser will have a regular amount to cut and not put the strain on two of the chasers only, which will make a ragged or stripped thread.

Continued accuracy is naturally the chief requirement of all screw cutting operations. In order to insure this, all chasers of a set must be ground uniformly to within a close limit of tolerance, otherwise the burden of cutting will not be distributed equally overall, and the result will be rapid and excessive wear on those that do most of the work, producing rough and irregular threads. Chasers working in this condition will require frequent grinding to keep them in shape and the threads on the run of work on which they are employed will be neither accurate nor uniform. It is extremely poor practice to allow the dies to run until they have become very dull. If just touched up from time to time, the dies will not only last a great deal longer but will produce far better work throughout their effective life. It is naturally impossible to do this properly by hand, as uniformity of grinding is out of the question. To overcome this, as well as the numerous other difficulties of hand grinding, there is now a number of chaser or die grinders on the market, as per illustration Figure 2, manufactured by the Modern Tool Company, Erie, Pa.

This machine is adapted for grinding any make of

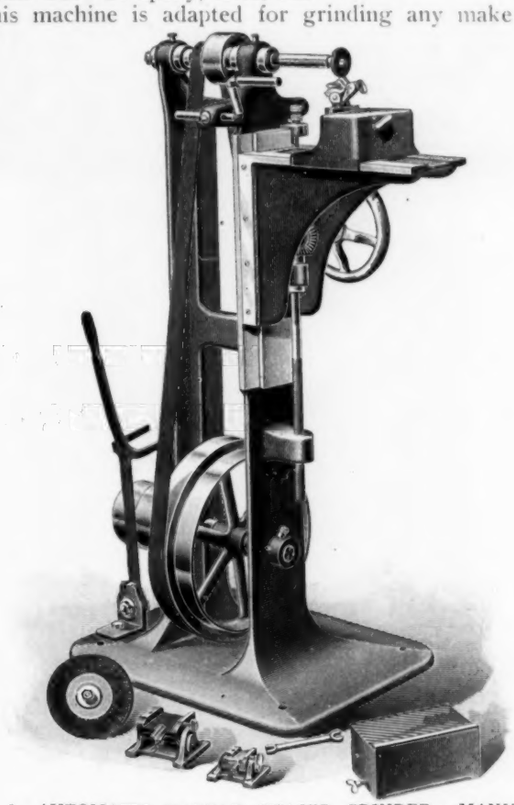


FIG. 2. AUTOMATIC THREAD CHASER GRINDER. MANUFACTURED BY THE MODERN TOOL COMPANY, ERIE, PA.

thread chaser, whether of a stock or special type. The vise in which the dies to be ground are held is universally mounted and the adjustments provided are such that the dies may be ground square or to any radius according to its shape, right or left hand. The vise may also be set to permit of grinding the throat of the die to any desired clearance. For brass or similar free cutting metal or where the thread is desired to run close up to the shoulder, as is generally the case in ninety per cent. of the brass goods manufactured, the champer in the throat is one of the main features and same should be ground sufficient to give the proper clearance. This should be enough to free the tool in cutting and is something that must be determined by experience in every case. The

*Foreman Brass Finishing; H. Mueller Manufacturing Company, Decatur, Ill.

proper allowance to be made for this can be determined readily by the skilled tool grinder at a glance, while one or two trials will serve to make it plain in case the operator is not familiar with die grinding.

The grinding of the top or cutting edge of the chaser is a very important point, and in deciding on this angle

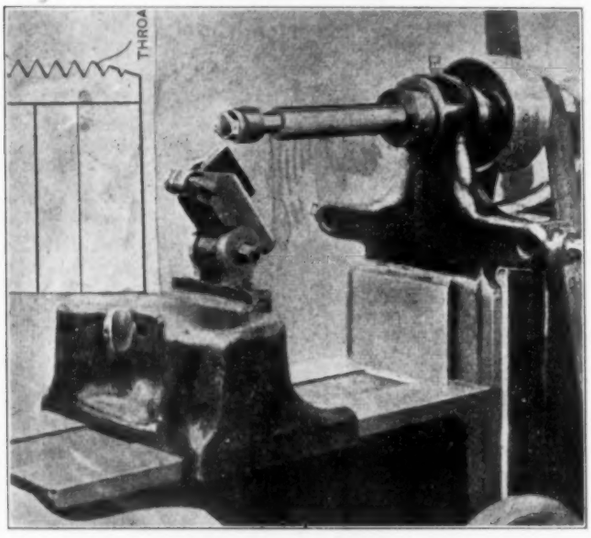


FIG. 3. CUT OF CHASER SHOWING THROAT OF SAME, AND GRINDING THE CHAMPER OR THROAT.

the material or alloy of the metal should be given consideration, as a chaser ground with a slight drag, cut to be used on an alloy of red steam brass metal would not work on a yellow brass or tubing which should have a lip cutting edge, which would allow the dies to clear itself of the chips. As an illustration, a brass finisher using a single pointed tool threading red brass on a Fox lathe, his tool has very little side clearance and no lip or top rake, and he gets good results. When threading brass tubing Tobin bronze or copper he uses a tool with lip or top rake and has good results. We know that if the single pointed brass threading tool is not made in this manner it is likely to run ahead of the feed and produce a rough and uneven finish. The same applies or is encountered with threading chasers held in a die-head where they are required to make their own lead; they run ahead of the pitch sometimes and make the back part of the thread rough or sometimes strip same entirely off, which shows the die is leading ahead too fast. You will have the opposite condition happen, that is, the front side of the thread is rough, which is caused by the die not leading fast enough. The operator should always examine the first pieces that he has machined for any defects in perfect thread, as the majority of threads have to make a water or steam tight joint, sometimes under very heavy pressures, and it is therefore necessary that the threads be perfect. The way to govern the leading of the die is to grind more or less relief in the throat as the case requires.

On seventy-five per cent. of the goods manufactured it is impossible to govern the cutting of dies with the relief in throat as you have to cut the threads up to a shoulder. You can not regulate them with the relief in throat. This can be overcome if the chasers are lapped out with a carborundum oil stone of one hundred and eighty grain, and beveled off the same angle as the thread as per cut No. 4. It should be held in the hand and worked across the threads at the desired angle to make the dies faster or slower as required. The writer has seen some mechanics correct chasers with a three-cornered saw file by filing the threads instead of lapping same with an oil stone. Filing can be used sometimes for making the corrections, but unless the file is handled with a certain amount of dexterity the results are not always gratifying. The writer has found from experience that die chasers

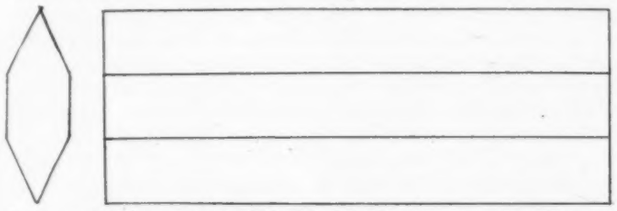


FIG. 4. SHOWING THE ANGLE BEVELED OFF ON THE CHASER SAME AS ON THREAD.

which gave satisfactory results on straight threads were made slightly taper, about ¼ inch to the foot, as the wear on the thread is in the front and the strain is also at that point and enables a parallel thread to be cut, and it also increases the output, as the chasers stand the wear and tear of the general run of work.

It is extremely poor practice to work a die until it becomes very dull. Frequent light grinding or touching up will not alone result in very much better work but will also greatly lengthen the life of the dies. But how often this should be done in the case of any particular type or size of die is something that will vary so widely with the conditions that it can not be answered definitely. It must be determined entirely by the character of the material thread being cut and the speed. A maximum safe speed for the operator of any thread cutting die is one short of which the die begins to show excessive wear, and proceeding on the same basis it may be said generally that a die should be ground as frequently as it shows sufficient wear to effect the rapid production of uniformly accurate work. In making brass chasers it is absolutely necessary that threads on them be relieved and the more so on chasers to be used on taper threads, as it allows them to cut free and not choke up with chips in threads. As a rule a brass cutting threading chaser or die will chatter when too sharp, which can be remedied by dulling the chasers by applying a mixture of powdered carborundum mixed with oil and applying a slight portion on the article and work the die-head over it two or three times until the desired results are obtained. The grinding and proper care of threading dies and chasers is very important, as there are so many different items to contend with, but with proper care and attention, good results can be secured.

FIG. 5 SHOWS CUT OF SPLIT DIES USED FOR THREADING ON AUTOMATIC MACHINES.

TREASURY DECISIONS.

The Customs Officials reported that as metal is the component of chief value in watch chains made of metal and leather, they should be taxed at forty-five per cent. as "metals not specially provided for." The importers, A. Strauss & Company, alleged the goods to be "manufactures in chief value of leather," and asked for a rate of forty per cent. The Collector's higher assessment was affirmed.

HINTS ON BRASS FOUNDING

W. R. Dean.

(Continued from February.)

It is to the advantage of the foundryman as regards economy to use as much scrap as possible. The quantity to be used varies from ⅓ to ⅔ of the melt according to the number of times the scrap has been remelted. In using old metal many more impurities are liable to be introduced, than with new metal. While in some classes of work this makes no difference, in the foundry where quality is the keynote it will in time cause trouble. For the presence of notable quantities of foreign matter is generally exhibited by increased hardness and a modification of the fracture. This can sometimes be overcome by the introduction of some deoxidizing agent, as silicon copper, phosphor copper, black oxide of manganese, or a small piece of zinc and a small piece of lead to keep the cutting qualities. If the metal is to be used for plumbers' goods, steam or valve goods, it will be better to get an analysis first if you don't intend to use new metal in the melt. In the case of the scrap consisting of old valves, and worn out castings, etc., it is a good plan to melt the castings first and pig them, then getting an analysis of the pigs before making any test work, and adding zinc, tin or lead to bring the ingots' composition up to some standard formulae.

The difficulty of maintaining uniformity in an alloy after repeated meltings is greater in an alloy containing three or four metals than in one containing only two. Thus German silver requires more care than brass. The alloy that contains as an essential constituent a volatile metal, such as zinc or antimony is generally altered most by remelting and it is requisite to know, at any rate, approximately, what the furnace loss is, so that the defection may be counterbalanced by the addition of the quantity of fresh metal necessary to maintain the right mixture. Sheet No. 4 in the September, 1911, issue of The Metal Industry shows a daily report giving the approximate loss, then it can also be checked by chemical analysis. In making experimental tests a small melting furnace, such as used in a metallurgical laboratory, a strong pair of hand tongs, rolls and an anvil would be useful adjuncts to every casting shop. The quantity of metal used in the experiments need not be over one pound in weight and could be cast in a long strip, which would make it suitable for rolling, stamping, etc. Such test pieces carefully labeled and preserved would be very valuable at some future date as a reference, and would at some time be valuable in stopping a leak in workmanship or production.

It is annoying sometimes after producing a quantity of castings to find the metal unsuitable for the work, either from unsuitable constituents, improper mixing or impure materials; which annoyance could be avoided by a few preliminary trials on a small scale. Such trial tests could be made in an iron or sand mold and be made to approximate the cooling of a large mass by judicious treatment. This small test plant could be used for a good many useful trials with new combinations, and the effects of impurities noted.

THE COMMON ALLOYS.

The common alloys can be divided into three classes: brass, bronze and white metal. Brass is probably the oldest alloy and was employed by the ancients; it is a mixture of copper and zinc in any proportion, according to color, called yellow brass, or red brass. Red brass has a marked predominance of copper and reddish color. When the proportion of zinc increases so that the alloy shades on the yellow, it is known as yellow brass. The yellow brass, according to the amount of zinc, has different tinges, as reddish yellow, greenish yellow and golden yellow. Bronze is an alloy of copper and tin, with lead and zinc sometimes added. Usually when lead and zinc are contained in the alloy besides the copper and tin it is called composition. The white metals are German silver, white brass and babbitts or white pattern metal. There are a great many formulae for alloys and to enumerate and give a description of all the ones used would take a great deal of time and space. But a few of the most common ones can be taken up and from these one can with a little study build up their own formulae.

Of the bronzes, Government bronze (composition G.) is best known. Tin has the property of hardening copper in the proportion of which it is added, so the Government bronze with 10 parts of tin is a strong, tough bronze, and very useful. As it is almost impossible to get a satisfactory casting out of copper and tin on account of tin sweat or its being porous, some deoxidizing agent must be added, so 2 pounds of zinc is used. This

FIG. 1. TELEMOTOR STAND WEIGHING 200 POUNDS AND STANDING 400 POUNDS PRESSURE.

acts as a purifier of the copper and holds the tin in combination. Thus we have Government bronze 88 copper, 10 tin, 2 zinc. In making the alloy it is best to add the zinc just before the metal is ready to pour. If it is added too early the metal is apt to soak and the zinc pass off as oxide and allow the copper to absorb more oxygen. Government bronze should never be overheated or allowed to soak and should be well covered with charcoal and poured not too hot unless the casting is very, very thin. The 88, 10 and 2 mixture is not ideal for bearing, although used as such. It has found a use for connecting rods in gasolene engines to some extent, although it is being replaced now by steel or manganese bronze. It is used very extensively on machinery, especially on Government work. It is excellent for castings having to stand water or air pressure. It is used for

making circulating pumps and condenser tops in Government boat. For an alloy having to stand a high water pressure of from 300 to 400 pounds, and used in castings of some weight, an alloy of 80 copper, 12½ tin, and 2½ zinc pounds is better. Fig. 3 shows a telemoter casting weighing 200 pounds, and having to stand 400 pounds water pressure. This telemoter is very ihtricate in the cores and the mold has to be carefully made, and the metal given the best attention to insure it being water-tight.

Manganese bronze is a very common alloy now, and is used extensively for valve stems, propellers, propeller blades. The formula varies some in the proportion of zinc, according to the specifications, but a standard is copper 58, zinc 42, alloy 2½ pounds, and aluminum ½ pound. It is also one of the hardest alloys to cast.

Phosphor bronze is used quite extensively in connecting rods for gasolene engines and for bearings; it is also used for gears and gear blanks. Fig. 2 shows a phosphor bronze gear. It is replaced now a great deal by

FIG. 2. A PHOSPHOR BRONZE GEAR WHEEL.

FIG. 3. MANGANESE BRONZE GEAR WHEELS FORMERLY MADE OF PHOSPHOR BRONZE.

Yellow brass is used a great deal in the casting shops with the addition of tin for strength, closeness of grain, and sharpness in running, while lead is added for fast cutting qualities. On account of the cost of tin not more than 2 to 4 per cent. is used, while lead weakens it if more than 5 per cent. is used, usually 3 to 4 per cent. is sufficient. Most of the formulae given for plumber's brass goods show copper 75 per cent. zinc, 20 per cent. tin, and 3 per cent. lead. While the ingots brass used averages an analysis of 68 per cent. copper, 30 zinc, 1 tin, and 3½ lead. This ingot brass can be bought in different grades as No. 1 and 2 Ingot, or you can get it to your own specifications. The founder can buy it and increase or decrease the zinc content by the addition of zinc or copper.

The valve manufacturers have several formulae, but they buy a great deal of red brass, a good many of them using new metal in conjunction with the scrap. A few valve manufacturers use new metal entirely, putting out a high class of goods. The formula most commonly used, known as cheap valve mixture is copper 86, tin 5, zinc 5, and lead 4 parts. The best valve mixture is copper 86, zinc 4, tin 7, and lead 3 parts; the zinc and lead decreased and the tin increased. By this it will be seen how to make up your own formulae of any class of work. By increasing the tin we make the grain closer and make an alloy that will withstand steam and water pressure much better. A good bearing metal is made up of copper 80, tin 8, lead 10, 15 per cent. phosphor copper ½ pound, or zinc 2 pounds. Steam metal is copper 80, zinc 2½, lead 2½ and tin 5 pounds. This is used by the manufacturers of steam goods. A formula used by the manufacturers of saddlery hardware is similar to manganese bronze in color and texture. It consists of copper 56 to zinc 42, aluminum 6 ounces and lead 2 pounds. Without the lead this is a cheap, strong mixture, resembling manganese bronze. The addition of lead increases the cutting qualities but decreases the strength.

manganese bronze for gears. Fig. 3 shows a pile of gears formerly made out of phosphor bronze, now made out of manganese bronze.

A good formula for phosphor bronze for gears is copper 80, tin 10, lead 5 pounds and phosphor copper ½ pound.

The white bronzes include the antifriction alloys, white brass, and babbitts and German silvers.

(To be continued.)

INDUSTRIAL POISONING AND ACCIDENTS.

[From United States Consul General John L. Griffiths, London, England.]

A parliamentary paper has been issued giving the statistics of industrial poisoning, fatal and non-fatal accidents, and dangerous occurrences in factories and workshops in the United Kingdom in 1911. Following is an abstract:

There was an increase in the number of lead-poisoning cases from 505 in 1910 to 669 in 1911. The increase was principally among coach and car builders. Lead poisoning was responsible for 37 deaths. There were 12 accidents from mercury poisoning and 10 from arsenic poisoning with 1 death from the latter cause. The cases of anthrax increased from 51 in 1910 to 64 in 1911, while the number of deaths rose from 9 to 11. There were 156 fatal accidents in the shipbuilding industry in 1911 as compared with 1910. There was an increase also in the number of accidents in the general engineering trades, other than marine and other locomotive work. The increase of accidents in the chemical industry from 55 in 1910 to 86 in 1911 was wholly due to one very serious accident, namely, the explosion of an oil-cake mill in Liverpool in November of last year, which resulted in 36 deaths.

THE ASSAY OF NICKEL PLATING SOLUTIONS

By G. Bernard Brook.

To no section of industry is the need of technical instruction more essential than to that large and increasing body of men engaged in the deposition of metals. The principles governing the processes employed demand as wide a knowledge of the two kindred branches of science —chemistry and electricity—as a man's leisure may permit him to acquire. The period of "rule of thumb" practice is passing, and it behooves the younger men to secure such a theoretical training as shall ensure success in the workshop being predetermined and not accidental. With such a sufficient training the evolution of the electroplater would be rapid, and his usefulness might extend to departments other than his own. The chemical knowledge that could be gained stops far short, of course, of that necessary for an expert chemist, yet such limited knowledge, with proper guidance, could be of much value in the workshop.

The assay of potassium cyanide, and the determination of "free cyanide" in plating baths have received a full measure of recognition in the courses prescribed by technical institutions and in students' manuals. The subject of nickel has received notice far from commensurate with the enormous industry connected with its deposition. The difficulties that beset the deposition of this metal also extend to its quantitative separation, and few text books refer to the assay of nickel plating solutions. A rapid and accurate method should therefore be welcome. It is based on many years' experience and demands a very limited amount of chemical apparatus. Hitherto the assay of nickel solutions has been made by one of two methods:

(a) The determination of the specific gravity, generally by Twaddell's hydrometer, and its rough interpretation into so many ounces of double salts per gallon.

(b) The chemical analysis of the solution.

The former gives approximately true results for "new solutions," but gives erratic and even entirely false results with solutions after a few months' working. The older the solution, the less dependable the result, as may be shown presently.

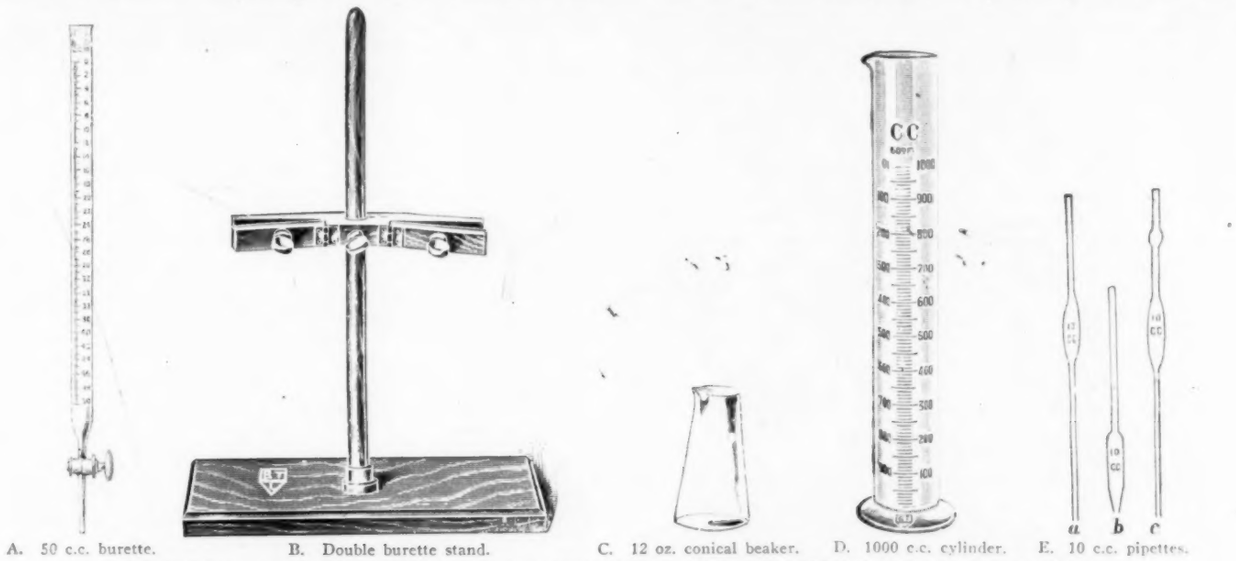
The second method, involving exact analysis, was of course beyond the scope of the plater. The cost of such analysis often decided a manufacturer to let things slide in the hope that some subtle agency would "make things right" tomorrow.

I propose to outline three distinct methods of assay, all within the capacity of a plater with some theoretical training.

I. Cyanometric Assay.

This method as its name implies is based upon the measure of cyanide required to combine with the nickel. It is a volumetric method, *i. e.*, a process in which measuring largely takes the place of weighing.

This method of assay, as arranged, dispenses with the need for a chemical balance, the initial cost of which would be a large factor in many plating establishments. This question of cost has largely weighed with the author in the selection of the necessary apparatus, which is as follows:



A. 50 c.c. burette. B. Double burette stand. C. 12 oz. conical beaker. D. 1000 c.c. cylinder. E. 10 c.c. pipettes.

CHEMICAL APPARATUS NEEDED FOR CARRYING OUT THE METHOD DESCRIBED IN THE ARTICLE.

Two 50 c.c. burettes as *A*.
Double burette stand as *B*.
Two 12 oz. conical beaters as *C*.
One 10 c.c. cylinder (*D*). (Illustration is marked up to 1000 c.c.)
Two 10 c.c. pipettes (*E*). (Illustration shows three types.)
10-oz. stoppered bottle of .880 Ammonia.
10-oz. stoppered bottle of 10% Potassium Iodide.
1 litre of Standard silver solution (Decinormal).
1 bottle brush.

These may be purchased from any scientific dealer for a very moderate sum, which would probably not exceed

$6. The Standard silver solution will be prepared, standardized and guaranteed by the author.

In addition to these, the following, obtainable to save carriage, etc., of any local chemist, would be required:

2 Winchesters of distilled water.

1 oz. pure Potassium Cyanide.

PREPARATION OF POTASSIUM CYANIDE SOLUTION.

Take one of the Winchesters of distilled water, pour out sufficient to bring the level of the water just below the shoulder of the bottle. Add the whole of the ounce of pure cyanide and shake the bottle thoroughly for some minutes after the cyanide has completely dissolved. This solution, after it has been standardized against the silver solution, becomes a standard solution of known definite value. No water must be added to standard solutions, and they must be kept in a cool dark place. Whenever used in a measuring vessel, the vessel must be drained as completely as possible and a small quantity (say 10 c.c.) of the standard solution poured (or drawn) in, the sides of the vessel completely moistened with this portion, the solution thrown away, and the vessel again drained. The measuring vessel is now filled with the standard solution and the estimation proceeded with.

STANDARDIZATION OF THE CYANIDE SOLUTION. (A.)

This must be done with the greatest care, and since cyanide gradually undergoes decomposition in solution, it is desirable to restandardize if more than a month has elapsed since the cyanide was used. On the accuracy of this standardization depends the accuracy of all the nickel determinations made with it. Having rinsed out the two burettes (label them "Silver" and "Cyanide" to avoid mistakes) with their respective solutions, fill them and set them accurately at zero, as below, and run 30 c.c. of the cyanide solution into a clean conical beaker. Allow a few minutes for the burette to drain, and see that the reading is exactly 30 c.c. Add an equal bulk of distilled water, 10 c.c. strong ammonia and 5 c.c. pot. iodide solution. Now run in the silver standard carefully with constant circular agitation. The white precipitate, which first forms, disappears on shaking. As further additions are made, the precipitate dissolves more slowly. The silver solution must now be added a few drops at a time until one drop produces a permanent cloudiness. The volumes of the two solutions are now read off carefully.

Suppose that the reading of the silver burette showed 27.75 c.c., and that of the cyanide burette showed 30.0 c.c., then it is obvious that the cyanide solution is weak, since 27.75 silver are equivalent to 30.0 c.c. cyanide. We must multiply the cyanide volume then by such a number as will bring it to exact equality with the silver. Hence we should use what is called a factor—

Since $30 = 27.75$ correct

$$1 = \frac{27.75}{30} = 0.925 = \text{Factor to } \textit{correct} \text{ cyanide.}$$

If, however, the volume of silver required had been 32.5 c.c. in the above case, the cyanide would obviously have been too strong and the factor would have been greater than 1.

Hence since 30.0 c.c. cyanide = 32.5 c.c. silver

$$\text{Factor is } \frac{32.5}{30} = 1.083$$

in which case 1.083 would have been the factor to *correct* cyanide. The use of this factor will be seen in B.

Label the bottle clearly potassium cyanide. Factor to correct $\frac{N}{10} = \text{———}$.

ASSAY OF THE PLATING SOLUTION. (B.)

Sampling. From any nickel plating vat, preferably first thing in the morning, remove a sample in a clean, dry tumbler glass. Wash one of the 10 c.c. pipettes and remove all the water you can from the inside by blowing down the pipette.

Draw up about half the pipette full of the nickel plating solution, hold it horizontal and wet every part uniformly (to remove all rinsing water). Blow this portion down the sink, and by gentle suction draw up into the pipette more of the Nickel solution until it reaches an inch above the mark on the upper portion.

Accurate Measurement. Quickly slip the finger over the top and allow the solution to run slowly down until the liquid coincides with the mark mentioned. The pipette now contains exactly 10 c.c.; allow it to drain into one of the conical beakers (previously cleaned) and remove the last traces by slightly blowing down the pipette, holding it against the side of the beaker. Add sufficient distilled water to one third, fill the beaker (*care* not to splash), then add 10 c.c. ammonia and 5 c.c. potassium iodide solution. A deep blue solution results.

The Titration. Fill two burettes, one with the standard silver, the other with cyanide solution. Hold a piece of white tissue paper behind the burette and carefully set each to zero (*i. e.*, the topmost mark 0) by slightly opening the tap.

Run into the nickel solution about 2 c.c. of the silver standard. This causes the solution to become milky. Now add the cyanide solution a few c.c. at a time, with constant circular shaking, until the solution changes to a wine yellow color and *perfectly clear*. Once more run in the silver solution, this time drop by drop until *one drop* caused a *permanent* milkiness in the nickel solution after thorough agitation. This turbidity marks the *"end point."*

THE CALCULATION.

Read off both burettes. Correct the volume of the cyanide by multiplying it by the factor found in (A).

Thus if the volume of cyanide used were	45.1 c.c.
and the factor found in A were	.925
Then the correct cyanide volume = 45.1 × .925 =	41.7 c.c.
From the corrected volume of cyanide	= 41.7 c.c.
deduct the volume of silver solution	= 3.6 c.c.
Difference = cyanide used up by nickel	= 38.1 c.c.

As each c.c. of cyanide is equivalent to 4.75 oz. metallic nickel per hundred gallons working (as in this estimation) on 10 c.c.,

38.1 × 4.75 = 181 oz. per hundred gallons nickel.

equivalent to 75 lbs. 4 oz. per hundred gallons double salts.

STATEMENT OF RESULTS.

Since the amount of actual metallic nickel is what is required, I think it would be better in all cases to state the nickel content in ounces, per 100 gallons, and not as "double sulphate," for the following reasons:

In a plating solution said to contain 1 lb. "double salts" per gallon, and 2 oz. "single salts" per gallon, the real amount of nickel, which is the one thing needful to know, is difficult at sight to judge.

Since "double salts" contain 15% nickel and "single salts" contain 21% nickel, this solution would obviously contain: 2.40 + 0.42 = 2.82 oz. nickel per gallon — or 282 oz. nickel per 100 gallons, which conveys a much clearer idea than the first statement.

It has been necessary, for obvious reasons, to set out the details clearly, fully and simply, which I trust may not be deemed tedious by those whose training would allow of this matter being stated in a more condensed form. For the same reasons, in order that the process may be carried out by any ordinary plater, the principles and chemical reactions involved have been omitted.

[To be Continued.]

PATENT CONTROVERSY OVER BEARING METALS

SOME RESULTS OF TESTS WHICH HAVE BEEN CARRIED ON BY "THE METAL INDUSTRY" DURING THIS FAMOUS DISCUSSION WHICH BEGAN IN THE JULY, 1909, ISSUE OF "THE METAL INDUSTRY"—FOURTEENTH PAPER.

In the July, 1911 issue of THE METAL INDUSTRY, Andrew Allan, Jr., in his reply to G. H. Clamer's paper of May, 1911, made the following suggestion:

"I would suggest that Mr. Clamer send to THE METAL INDUSTRY one hundred pounds of each of the above alloys (Cu.50-Pb.50 Cu.65-Pb.30-Sn.5 Cu.67-Pb.24-Sn.9). THE METAL INDUSTRY to have same analyzed, and if found to be of the proportions called for and strictly lead-copper and lead-copper tin, to have said alloys recast into merchantable castings under their supervision. If these castings show no lead sweat or segregation, I will willingly assume all costs incurred by this test and concede Mr. Clamer to be one of the ablest metallurgists of the twentieth century."

In October, 1911, Mr. Clamer accepted the suggestions and sent to the office of THE METAL INDUSTRY several ingots of the following composition:

1—Marked X, copper 65 per cent., lead 30 per cent., tin 5 per cent.

2—Marked XX, copper 50 per cent., lead 50 per cent.

3—Marked XXX, copper 67 per cent., lead 24 per cent., tin 9 per cent.

4—Marked XXS, copper 50 per cent., lead 50 per cent, and 1 per cent. sulphur.

Mr. Clamer said:

"Analysis of these ingots will show they contain no sulphur, or at most the usual trâces which are present in raw materials, or taken up from fuel in such amount only as would be present by using the very best of raw materials and crucible melting."

Samples marked XX showed lead segregation and were therefore not analyzed. Samples marked XXS were also exempt from the tests, being merely exhibits. Samples X and XXX were analyzed, and the following results were published in the January issue of THE METAL INDUSTRY:

	Ingot x.	Ingot xxx.
Copper	67.36%	65.87%
Tin	9.21%	5.02%
Lead	23.21%	28.96%
Sulphur	0.05%	0.04%
Iron	0.07%	0.07%
Arsenic	0.02%	0.01%
Nickel	None	None

It will be seen from the above that the compositions as agreed upon by Messrs. Allan and Clamer have been fulfilled.

The casting test, which consisted of making a cylinder eight inches long by five inches in diameter and examining the same for lead sweat and final analysis for segregation, was next carried out with the result that no segregation can be noted by visual examination. The analyses of sawings taken from the top and bottom of these billets proved to be as follows:

		Copper.	Tin.	Lead.
x	Top	62.90%	8.51%	28.40%
Copper 67				
Tin 9				
Lead 24	Bottom	66.26%	8.82%	24.59%
xxx	Top	66.70%	4.88%	28.31%
Copper 65				
Tin 5				
Lead 30	Bottom	65.92%	5.04%	28.92%

Under date of February 26, 1912, Mr. Clamer writes:

THE METAL INDUSTRY, New York.

GENTLEMEN:

Referring to analysis of billets:

These billets, you will note, in accordance with my contention and prediction, show less segregation of lead with lower tin content alloy.

I would thank you to kindly make the following further tests and witness same yourself.

1. Weigh out metals in proportion of 65 per cent. copper, 5 per cent. tin and 30 per cent. lead, in sufficient quantity to cast into same size cylinder as previously used.

2. Weigh out metals in proportion of 60 per cent. copper, 10 per cent. tin and 30 per cent. lead, in sufficient quantity to cast into same size cylinder as previously used.

You can no doubt arrange to make these tests at the Williams Foundry or foundry of Jno. Gillen & Son, in Jersey City. Please send us bill for same.

You will find the former casting will not show lead sweat, whereas the latter one will.

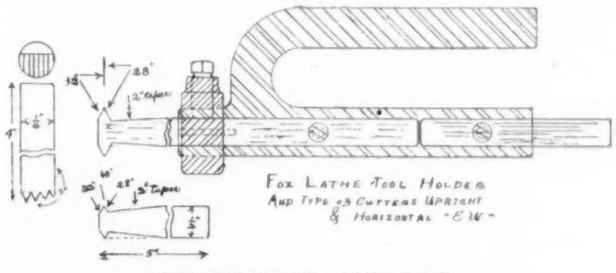
Desire you to make this test in order to prove my contention that nothing but ordinary foundry practice is required for producing such alloys, if the tin and copper are in correct proportions, whereas if they are not, the alloy will show lead sweat.

The above instructions were carried out Friday, March 29, and the results are as follows:

1, billet marked X, containing copper 65 per cent., tin 5 per cent., lead 30 per cent., shows no visible lead sweat. 2, billet marked XX, containing copper 60 per cent, tin 10 per cent., lead 30 per cent., shows lead sweat for upwards of an inch on the bottom. All of the ingots, billets and copies of analyses mentioned in this report are on exhibition and file at the office of THE METAL INDUSTRY, 99 John street, New York City, and can be seen by anyone interested.—[ED.]

FOX LATHE TOOL HOLDER.

Every brass finisher operating a Fox lathe will appreciate the tool holder plan shown in the accompanying sketch. This holder is suitable for both internal and external work, but more particularly for thread cutting and will prove itself a wonderful metal saver, also disposes of the blacksmith work. The sketch shows cut-



TOOL HOLDER FOR FOX LATHE.

ters which can be produced from round drill rod shaped for a 60 deg. thread, and stationed in the holder, held by a grip collar and an abutting stud, which prevents the cutter from turning or slipping endwise. The holder can be made of suitable size machine steel to fit the chasing bar tool post of the lathe and case hardened to prevent bruising. E. W.

MALAYSIAN TIN EXPORTS.

The weight of tin (tin exported in the form of ore having been taken at 70 per cent. of the gross weight of the ore) exported from the Federated Malay States during 1911 was as follows: tin, 11,161 tons; tin contained in ore, 38,285 tons; total, 49,446 tons. This is an increase of 320 tons over the exports of 1910.

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THE METAL INDUSTRY

With Which are Incorporated
THE ALUMINUM WORLD
THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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CONTENTS

SOME PROBLEMS OF CORROSION

We cannot gainsay the importance to the industry of the Institute of Metals' investigations into the cause of corrosion, especially of brass condenser tubes. Many theories have been elaborated from time to time to explain the cause of the mysterious eating away of the metal, but taken on the whole, these theories have been insufficient to reconcile with that which is actually found to occur in practice. It is known that all condenser tubes through or round which sea water flows are corroded, but the nature of this corrosion varies very greatly. By far the greater number of such tubes are merely uniformly corroded over as much of their surface as is exposed to salt water. This phenomenon is not what troubles the engineer so much as the local corrosion, or "pitting." We await with interest the series of contributions to the history of corrosion which Mr. Arnold Philip has promised to present to the Institute of Metals. From his position as Admiralty chemist he is in an exceptional position for dealing with the subject, and we hope that others will contribute the results of their experiences and thus throw some light upon one of the most insidious forms of disease to which some of the non-ferrous metals are subject. So far as Mr. Philip's investigations have gone, they reveal a satisfactory condition of affairs concerning the millions of tubes in use in the Royal Navy, which have been systematically preserved by the presence of electro-positive metals placed near and in metallic connection with them. This freedom from corrosion must, it is considered, be attributed to three causes: Firstly, to the particular chemical composition of the metal which has been selected for the manufacture of tubes. Secondly, to the very satisfactory manner in which tube manufacturers are able to produce tubes of the exact chemical composition specified. In this connection, it is interesting to note that during the past ten years only one case is known to Mr. Philip in which the chemical composition of a corroded tube could in any way be considered as not satisfying the specified limits, and in that particular case the 1 per cent. of tin had been omitted from the mixture. The third cause to which the freedom from corrosion of the condenser tubes used in the naval service is to be attributed is the consistent manner in which the use of steel, iron, or zinc protector slabs and bars, etc., has always been insisted upon.

The protective action of iron and zinc in condensers in the navy has been made use of in several forms. It was originally used in condensers in which the body was of cast or wrought iron, and the sea water passed

outside the tubes, and was therefore at the same time in direct contact with the outside of the metal condenser tubes and the inside of the iron case. Under these circumstances the protection was very complete, and whilst corrosion of the steel or iron casing took place, the corrosion of the tubes was practically unknown. A particular and remarkable case in which this protective action of a cast iron casing has been very clearly demonstrated is that described by Admiral J. T. Corner. Steel or zinc protector slabs and bars have been used attached inside the condenser doors, or on the tube plates themselves, or some of the tubes of the condenser have been replaced by iron or steel or even zinc rods, whilst in some condensers, built about four years ago, the bodies have been of metal of a composition closely approximating to that of the tubes, and the doors have been made of iron or steel. More recently condensers have been made with steel bodies.

The presence of a so-called electro-positive protective metal such as aluminum, zinc, or iron, is not, however, alone sufficient to prevent the corrosion of the condenser tubes immersed in the same bath of sea water. It is essential that there shall be a direct electrically conducting connection between the tubes and the protecting metal or metals, and that the protector metal and the condenser tubes shall be both immersed in the same electrolyte. It has been shown again and again that any want of a good electrical connection renders the protective action of the iron, steel, or zinc upon the condenser tubes quite nugatory. Where, however, the contacts of the protective metal with the tubes are satisfactory, corrosion does not occur. The ordinary normal length of life for the main condenser tubes of a battleship should be from ten to twelve years, and many such cases can be cited. Taking four first-class battleships, A, B, C, and D. These ships were attached to one port from 1897 to 1906, and during that period none of the main condensers was retubed except in D. In this particular case of the ship D, the main condensers were retubed in 1903, and again in 1909, but this was a special case; the necessity for retubing was not due to corrosion, but, the tubes being slack in the diaphragm plates, the vibration gradually caused the tubes to be cut through. In the case of the ship B, some trouble was experienced in 1899, but on fitting additional protectors this was remedied, and as far as is known, the condensers have not been entirely retubed to the present date—that is, thirteen years. The first-class twin screw armored cruiser of over 14,000 tons denoted by E recently had her condenser tubes examined, and they were found in good condition after having been in use for eight years. They were all replaced in the condenser after examination, and it is expected that they will last at least another three to four years. A first-class battleship F, built and put into commission four years ago, recently had her main condenser tubes drawn and examined, and these were all found in excellent preservation, with no trace of local corrosion; all the tubes were replaced.

A peculiarity of the small number of these cases in which corroded condenser tubes have been observed is the fact that in almost all the tubes the corrosion has occurred along the bottom of the inside of the tubes, and it is considered that this indicates that the trouble has been set up by the contact of particles of coke, carbon, or ferric oxide, or other conducting electro-negative solid materials deposited from the cooling water upon the inside bottom surfaces of the tubes setting up local galvanic action. Such action is, of course, increased when a condenser is not in use and the tubes remain full of sea water, for the particles then have time to settle out along the bottom line and give rise to the localized corrosion. If, on the other hand, the condenser is emptied of sea water when out of use, there would again appear to be a possible source of danger of corrosion along the bottom inside surface of the tubes, owing to the fact that this portion would be longest exposed to the joint action of salt water and air. In either method of treatment, however, it is considered that these causes of corrosion could be minimized or altogether removed if it were found to be at all feasible to employ condensers with vertical or strongly inclined tubes, and if every precaution were observed, to take up the cooling water from such positions as will give the least chance of ashes from the ash-ejector, etc., being carried into the tubes. It is important to bear in mind in considering Mr. Philip's investigations that his experience was based solely on bad cases of corrosion, minor ones not being referred to him, so that it is quite possible that the experience of others on this matter might be different.

NEW ALLOYS

The daily press tells us of a wonderful discovery in the way of a new alloy in Pittsburgh, Pa. The New York *Times*, of March 19, had the following:

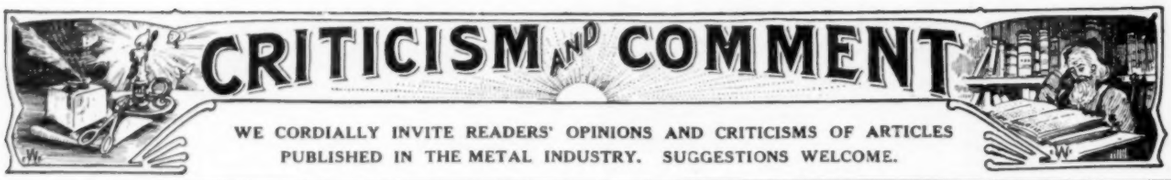
C. F. W. Rys, chief chemist of the Carnegie Steel Company, Pittsburgh, Pa., announced today that as the result of experiments by the Carnegie and the American Sheet and Tin Plate Companies, an alloy of metals which will withstand the tests of sulphuric acid, the chief enemy of tubing and sheet iron, has been discovered. The companies are seeking a composition which will withstand weather and water.

The alloy was obtained by adding less than one-fourth of 1 per cent. of copper. If further tests prove successful it is said that it will probably revolutionize the industry, and provide a new copper market.

The above is very interesting if true but the description of the alloy is disappointingly vague. To simply say that the alloy is obtained by adding less than one-quarter of one per cent. copper is, to say the least, puzzling. To what is the copper added to? The steel or iron? We fail to see what protective effect such a small amount of copper would have on iron or steel. The article concludes:

"We have discovered a composition that is unresponsive to all sulphuric acid tests, but we do not know yet whether it will withstand the test of weather," says Mr. Rys. "It will take another year to determine that."

We hope we will not have to wait a year before we can learn some more regarding this new compound.



STANDARD COPPER SPECIFICATIONS

To the Editor of THE METAL INDUSTRY.

I have your letter of December 29th, and thank you for your invitation to reply to Mr. Lewis' criticism of the American Society Testing Materials specifications in THE METAL INDUSTRY, September, 1911. I have discussed this with some other members of the committee who drew these specifications up, and we do not feel that there is anything to be gained by entering into a controversy on this matter. In the first place Mr. Lewis has not raised any question which was not fully considered and allowed for in the discussions of the committee at the time these specifications were drawn up. Mr. Lewis' remarks in these matters are based upon either a lack of familiarity with American conditions or a failure to appreciate the scope of the specifications as defined in the text.

In the second place the question, as far as the American trade is concerned, may be considered closed, as the specifications in their final form met with practically unanimous approval in the sub-committee, and this committee was thoroughly representative of the large producers and consumers of copper in this country. Finally, speaking from my personal standpoint in the interest of American refiners of copper, the adoption of these specifications with or without suitable additions or modifications for the European trade, while most desirable, is a matter which can best be handled by correspondence between the principal people at interest and by the International Society.

At the present time at least I, therefore, fear that it might only jeopardize the future acceptance of the letter of these specifications in Europe for me to enter further your correspondence columns, and I trust you will understand the situation.

LAWRENCE ADDICKS,
Superintendent, United States Metals Refining Company.
Chrome, N. J., January 2, 1912.

STANDARD ZINC SPECIFICATIONS

TO THE EDITOR OF THE METAL INDUSTRY:

Referring to E. A. Lewis' Criticism of Standard Specifications, for zinc, as published in THE METAL INDUSTRY, September, 1911, the amount of cadmium allowed in the intermediate and brass special spelters was fixed by the consumers and is rather higher than they would desire, but is as low as it is possible to have it and still obtain the necessary supply of spelter. There is a certain amount of spelter available that is lower in cadmium, but a large proportion of the brass special will run fully as high as this. No mention was made of tin, as none of the committee has ever found it in any spelter made from ore alone.

From an experience extending over a number of years, we have found that sawdust made more satisfactory and more economical samples than drillings. This, however, is a matter of personal preference, as both methods are allowed.

The method of determining cadmium given in the specifications was that adopted by one of the large brass companies, who found that by this method they could obtain constant results, and results that agreed with the producers, and it certainly seems simpler than to determine the cadmium twice, for the same spelter as recommended by Mr. Lewis.

With regard to all of the spelter specifications, it must be remembered that the quantities of impurities allowed are for rejection limits and do not show what is desired—it is simply that nothing worse will be received. If any producer should regularly deliver spelter that just met the specifications he would be likely to have trouble in selling his product.

I think the above includes all that is called for by Mr. Lewis' criticism.

New York, January 8, 1912. GEORGE C. STONE,
Engineering Department New Jersey Zinc Company.

TRUST COMMISSION

To the Editor of THE METAL INDUSTRY:

Regarding the conclusion of your editorial, published in December, 1911, which seems to favor the opinion of Andrew Carnegie for a Trust Commission, would say that I am absolutely and unalterably opposed to governmental regulation of mining, manufacturing and general commerce. All attempts along these lines by the States or national government will result in making increased trouble, and are too strongly socialistic for my stomach. If you will read the past history of this country, as well as others, you will find that all sumptuary legislation has proven ineffective, and has merely repressed and injured industry, without effecting the final result aimed at.

The fundamental difference between railways and mines is that railways are common carriers, and their construction and operation is rendered possible only by the power of eminent domain delegated to them by the government. Under these circumstances, the government furnishes an essential factor toward the construction and operation of railway lines, hence the public has a proprietary right to regulate the operation of railways, subject only to the other rights of the bondholders and shareholders.

In the case of mines, the government has neither more nor less right to interfere than it has with the owner of a farm or a beet-sugar factory. Some of the well-disposed gentlemen, including Mr. Carnegie, who are talking about government regulation and control of industries, are socialists in disguise, and no socialist ever did or can think straight, because his political theories are founded solely upon the desire of getting something for nothing. HORACE J. STEVENS.

Houghton, Mich., December 27, 1911.

THE LORDLY M. E.

BY W. H. PARRY.*

One of our strenuous contributors, who is a constant reader of THE METAL INDUSTRY, has had an experience which has turned him into a spring poet. We herewith print a few of his lines:

Who has not met him of the lordly mien,
Whose word is law and knowledge raw,
Who shakes your hand as though king of the land,
Whose conduct in the main is as shallow as his brain?

Ah! ye mortals of humble clay, what can one say
When he utters his final "Nay"! in his supercilious way?
But one feels the need of a very large mead,
To hand him just one on the "bead."

But away with such desire!
Though we would fire such an educated liar,
E'en though the consequence be dire,
We must needs another hire.

Then should he resign (which is not his line),
We would most certainly repine;
For his successor would make mistakes (as do all fakes)
Whose heads are empty as dried up lakes.

Who stakes all on such a cad must be mad!
And only bakes many, many sour dough cakes!
When the M. E. dies and with him his lies,
We generously say he was our size —— ——
Only when he told the truth and that was never, forsooth!

[Opinions on the above effusion are welcome from all M. E.'s. —ED.]

*Superintendent National Meter Company, Brooklyn, N. Y.

TUMBLING BARRELS

To the Editor of The Metal Industry:

In reply to the communication that appears in your March number, the article on Tumbling Barrels written for your December number had reference solely to the change that quite recently has taken place whereby nearly all hand burnishing of small articles made of soft metals has been done away with.

The use of hardened steel balls in wood-lined tumbling barrels brought about the change. But for ten years before they came into use the same process was carried out on articles made of soft steel that were afterward carbonized. Instead of balls, however, sharp pointed steel scrap, unhardened, was used. The scrap came from the trimming of other small steel articles and was carefully selected with reference to the sharp points that could get into places where the smallest of balls could not get in. Those carbonized articles were never hand burnished. Wood-lined tumbling barrels, in connection with the steel scrap, burnished them to perfection. They are burnished by that process today. Barrels for that purpose 24 inches diameter and 44 inches long, inside, lined with wood and partitioned into two compartments, were made and sold by Henderson Bros., Waterbury, Conn., in May, 1895. The doing away with hand burnishing dates from the introduction of hardened steel balls.

John Henderson.

Waterbury, Conn., March 15, 1912.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—Kindly give me a mixture suitable for ice machine casting. This mixture must polish and machine easily and test not below 3,000 pounds of cold water pressure.

A.—Hydraulic bronze will be a suitable alloy for your work. The mixture is:

Copper	100
Sheet yellow brass	25
Tin	10

The mixture should be melted and poured into ingots. It should then be remelted for casting.—J. L. J.

COLORING

Q.—I am soldering some spring copper-coated wire, and would like to color the solder as near as possible to the wire without plating.

A.—To color solder like copper, cleanse the solder and then brush lightly with a hand wire brush or rub with dry sea sand. Now take some sulphate of copper and dissolve as much as possible in a given amount of boiling water, one-quarter to one pint. Then let the solution cool and paint the solder with a small brush and immediately touch with a piece of iron. This will cause a deposit of copper upon the solder which should be satisfactory for your purpose. The iron used in precipitating the copper must be cleansed with emery cloth occasionally. Remove the excess of solution by wiping off with kerosene, gasolene or water, and then dry with sawdust.—C. H. P.

DIPPING

Q.—Will you kindly tell us of a method for removing the fire on silverware?

A.—All ordinary silverware and jewelry is firestained in the ordinary dip of two parts nitric acid and one part hot water. This dip should be used hot. The silver should be dipped for a few seconds only, then rinsed in hot water at once and examined; if traces of fire coat are in evidence, repeat the dip.—O. A. H.

DRILLING

Q.—I have to drill 5/16 of an inch in diameter in sheet lead ⅜ of an inch thick, and the drills do not cut the correct size and also leave the holes rough inside and burrs on the outside. I have used oil as a lubricant, but do not get results. Can you tell me how to overcome my trouble?

A.—Use a twist drill, lip same on cutting edge, put a pinch of crushed candle wax in the start of the hole after centering with drill and you will find that shoulder holes can be drilled to exact size of drill with a glassy smoothness to the full length of the drill. At a certain length the drill requires clearing of the cuttings, which come up in long tape-like lengths. A pinch of wax is required each time the drill is drawn out. By using this process, holes are quickly drilled and with a clean finish both inside and out.—P. W. B.

ELECTRICAL

Q.—How can I determine if a current of electricity is alternating or direct?

A.—An alternating current, sometimes called lag and lead, is known as a sinusoidal curve; that is to say, it is represented by a spiral curve circling a horizontal line. In other words, it changes its course periodically, the voltage and current starting from zero, rising to a maximum in one direction, dropping to zero, passing to a maximum in the opposite direction, and returning to zero, in a constantly recurring cycle. A practical way to detect these conditions is by taking a simple bar magnet and holding it near a lighted incandescent lamp. If the current is alternating the filament will vibrate, and, if direct, the filament will be attracted or repelled, accoring to the sign of the pole held near the lamp. The alternating current in a dynamo or motor is governed by the design of the commutator upon which the brushes rest, and collect or distribute current and cause the alternating currents produced in the armature to flow from the brushes as direct current.—E. W.

ETCHING

Q.—I am cutting signs and nameplates with nitric acid, having first thoroughly cleaned them, but obtain poor results. Can you tell me what is the trouble?

A.—Satisfactory etching cannot be produced on brass by the use of concentrated nitric acid. Dilute the acid with water in the proportion of one part nitric acid to four or five parts of water. If the lines are not etched clearly, add a very little chloride of potash. This addition is not absolutely necessary, as the proper dilution of the acid is all that is required.—C. H. P.

FINISHING

Q.—We are making some pewter candle sticks which want turning on the lathe and when finished look bright. We want them to have an old appearance and would be very much obliged if you could give us a recipe therefor.

A.—We suggest that the articles be immersed in a hot potash solution for a short time, after being turned. Then remove and wash in water, scour down the surface by using a tampico wheel and pumice stone, mixed with lard oil. This will give an old appearance to the surface. Afterwards remove the excess of oil and pumice stone by cleansing with benzine or gasoline and dry out with maple or boxwood sawdust. If the potash does not darken the surface sufficiently, then use undiluted muriatic instead of the potash and follow the other manipulations given.—C. H. P.

Q.—What is the exact process used in producing the antique finish on silver-plated copper goods to make them look like old Sheffield Plate?

A.—To produce the old Sheffield finish follow the regular methods of plating as far as the deposit is concerned. Then scratch brush the surface with fine brass wire scratch brushes; scour down the surface with a tampico brush, using very fine pumice stone mixed with bran and water for the purpose. Afterwards wash and dry carefully and then lacquer the surface with a transparent lacquer or the articles may be left unlacquered. The finish depends largely upon the fineness of the pumice stone and brush used.—C. H. P.

GILDING

Q.—Will you kindly give me, through the medium of your paper, a formula for gilding without gold or gold anodes, that is, by immersion only?

A.—We would advise you to use the salt water gold process, description of which will be found on page 28 of the January, 1910, issue of THE METAL INDUSTRY.

LUBRICATING

Q.—I am having trouble to get a nice smooth finish on aluminum, which I am turning and cutting threads on. I have used lard oil and also soda water as lubricants.

A.—Use kerosene oil or turpentine and you will get a smooth finish, and to a great extent prevent the liability of tearing the surface of the metal.—P. W. B.

MOLDING

Q.—Can you give me a core mixture that, when baked, will contain no gas?

A.—A core mixture made from beach sand and glue water (about 1 part of glue to 10 of water) ought to be satisfactory. You can also add about one part of linseed oil to 100 of sand. Do not set the cores until a short time before the molds are to be poured.—W. J. R.

OXIDIZING

Q.—Can you tell me what causes a smoky or reddish appearance on gold of 10 and 14 karat fineness? This is seen very plainly after jewelry has been plated and dried, and is very prominent on large plain surfaces.

A.—The reddish effect complained of is most likely due to red oxide of copper which is either originally present in the copper used, or has been formed in the alloy by improper melting or soaking in the fire. The failure of the enameling alloys used may have been due to similar reasons, or to the use of copper that is too dry. The use of good tough pitch Lake copper, careful melting and the addition of a trace of manganese-copper as a deoxidizer, ought to toughen the alloys you mention. As the black lead crucibles that are used for melting are liable to sometimes contain "sulphur or arsenic balls" that might contaminate your alloy and make it brittle, it is suggested that you obtain a Schwartz furnace, which are made in sizes holding a few pounds, with an alundum lining, suitable for gold melting.—J. L. J.

PLATING

Q.—How is chloride of gold made?

A.—Gold is dissolved in aqua-regia in the same way that silver is dissolved in nitric acid. The solution of gold chloride is evaporated over a water bath nearly to dryness to expel excess of acid, and the residue is dissolved in a small quantity of water. To the concentrated solution, add a solution of good potassium cyanide as long as a precipitate of gold cyanide is formed. Well wash the precipitate, and then add just sufficient potassium cyanide solution to dissolve it. Afterwards add, say one-fourth of the quantity of potassium cyanide used in dissolving the precipitate to give the requisite amount of "free cyanide."—K.

Q.—I am plating zinc that is glazed with glass and also leaded glass with a regular cyanide copper solution, which has been running for two years. The first year it plated all right but now the work comes out spotted with a brassy color. Can you give me a remedy?

A.—By continuous use your solution has probably absorbed considerable zinc. This would naturally lighten your copper deposit because brass is a mixture of copper and zinc. During the first year the solution probably did not become sufficiently impregnated with the oxide of zinc to be noticeable, although copper solutions when worked extremely cold will give a very light tone. Warm copper solutions always give the best results and the color is a more intense red. It might be advisable for you to increase the density two or three degrees by dissolving acetate of copper in a concentrated solution of cyanide of potassium. The acetate of copper should be dissolved in hot water and carbonate of soda, added to neutralize the free acetic acid the copper contains. This addition will no doubt restore the color of your deposit providing your bath is not used too cold.—C. H. P.

Q.—Will you kindly tell us the method of copper plating the backs of silvered mirrors to protect the silver from rubbing or wearing off?

A.—The backs of silvered mirrors can be coated with a special lacquer to protect the surface. Afterwards any of the bronze powders may be applied to give a copper, brass or aluminum appearance. Such lacquers may be procured from lacquer advertisers in THE METAL INDUSTRY. If you wish to copper plate the silvered backs, which may be readily done, use an acid copper bath for the purpose and give a deposit of from one-half hour upwards, according to the thickness of the deposit required. The copper solution for the purpose should consist of the following:

Sulphate of copper	1½	lbs.
Sulphate of Alumina	2	ozs.
Sulphuric Acid	1	oz.
Water	1	gal.

To prepare the bath, dissolve the copper crystals in as little boiling water as possible and then add the sulphate of alumina. Now add as much cold water as required to make up the specified quantity. Use a voltage of 1 to 1½ volts; amperage in proportion to the surface.—C. H. P.

Q.—I have an old bronze solution that persists in coating the anodes in patches of brown and lighter shades. After cleaning the anodes it will work all right for eight or ten hours and then they will be so thoroughly insulated that no current passes and more cyanide only means more metal. What is the remedy?

A.—Your solution is probably loaded down with carbonates, which are difficult to remove. Many platers in such a case reduce their bath at least one-half and then add water, which will give the bath more freedom of action. Sometimes a little more cyanide may be added, but usually the anodes remain clean. Prussic acid will neutralize the potassium carbonate and would probably assist in overcoming the trouble to a certain extent, but to be sure of the exact amount to add would require an analysis of the bath. As a try-out one-half ounce might be added to the gallon. Care must be used in its addition as it is very poisonous. We would suggest that you try out ten gallons of your solution by either one or the other of these methods and see which gives you the best results. If bisulphite of soda is added to cyanide of copper, bronze or brass baths continually in small proportions, the baths will work more freely and the metal will be reduced more readily at the anodes. Cuprous sulphite, which is readily soluble in cyanide, is formed by such additions.—C. H. P.

STRIPPING

Q.—Will you please give me some instructions for stripping silver and nickel plates by electricity; also a formula for a black finish on brass?

A.—For stripping with electricity use a dilute solution of nitric acid. For silver use a reversed current, making the articles the anode and using sheet of carbon for the cathode. For nickel dilute solution of muriatic acid or solution of sal ammoniac may be used, using the same method as above. For stripping silver from iron, a strong solution of cyanide should be used instead of the acid.

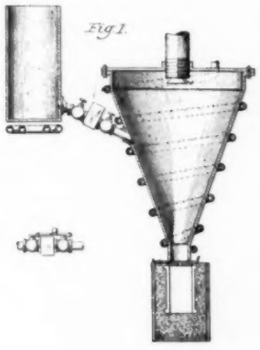
A formula for black on brass was published on page 479 of the November, 1911, issue of THE METAL INDUSTRY.—C. H. P.

PATENTS

REVIEW OF CURRENT AMERICAN PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

1,017,707. February 20, 1912. Casting Apparatus. F. W. Tracy, Chicago, Ill.

This invention relates to a device, shown in cut, for casting under pressure, and more particularly to devices for making castings into metal molds and its principal object is to provide means that will make these castings in such manner that the formation of bubbles or holes in the same is successfully avoided. These bubbles are usually caused where compressed air is applied to the flask to force the molten metal to all parts of the mold, and are very objectionable because of the additonal labor necessary to remedy the same after the finished casting has been cooled. Another object of the invention is to provide suitable means for feeding the molten material to a heated crucible in the exact quantities needed for each mold and keeping the same heated prior to being emptied into the flask.



1,017,981. February 20, 1912. Electroplating with Zinc. A. A. Lemêtre, Paris, France.

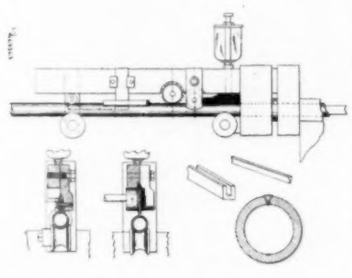
This invention has for its object to provide a novel bath and process for electroplating metals and mechanical parts of iron, steel and the like with zinc in order to protect the same or prevent them from rust. The invention is characterized by the employment of a cold bath of a special composition from which there is deposited electrolytically upon metal parts such as already mentioned an adherent layer of metallic zinc. This bath comprises the chemical compounds set forth below in substantially the following proportions:

Sulphate of zinc	12 kilos.
Ammonium chloride	3 "
Sulphate of soda	2 "
Sulphuric acid	1 "
Water	100 liters.

The bath should be used in a cold state, that is to say, it should not be maintained at a temperature exceeding approximately 30 degs. centigrade.

1,019,043. March 5, 1912. Machine for Making Metal Tubes. Henry Higgin, Newport, Kentucky.

The object of this invention is to provide an attachment or additional device for tube-making machines in order to prepare the tube for brazing, and the invention consists of that novel construction and arrangement of parts, in which mechanism is provided, as shown in cut, for cutting a longitudinal groove at the meeting edges of the tube after it is formed, which groove is adapted to receive a specially designed strip of spelter solder which is fed continuously between the meeting edges of the tube as the tube is fed from the forming devices, and by which mechanism the tube is fully prepared for the brazing machine with the proper amount of solder held in place between the meeting edges of the tube so that when submitted to the brazing furnace, the seam can be perfectly and securely brazed without waste of solder and with a uniform amount of solder distributed throughout the length of the seam.



1,019,524. March 5, 1912. Process of Remelting and Refining Old or Scrap Copper Alloy. W. S. Rockey and H. Eldridge, New York, assignors to Metallurgical Research Company, Arizona.

This is a process covered by the following claim:

3. The process of refining old or scrap copper alloy consisting in first reducing to a fluid condition by heat a suitable flux, preferably boron trioxide, having the quality of dissolving or holding in suspension the oxides, and other metallic impurities contained by the metals which form the alloy, then submerging beneath the flux the old or scrap copper alloy and fusing same beneath the flux causing the flux to dissolve or hold in suspension the metallic impurities contained in said scrap metal, thus purifying the alloy metal beneath the surface of the flux, and then adding carbon to further reduce the metallic impurities contained in the flux.

1,019,963. March 12, 1912. Anti-Corrosive Alloy or Metallic Compound. Gaston Jacquier, Belgravia, near Johannesburg Transvaal.

This invention relates to a new or improved alloy or metallic compound which is capable of resisting the corrosive action of sulphuric acid, cyanide solution, etc.

The alloy can be used for the manufacture of pipes, tanks, taps, valves, screens, cables, ropes, skeps, cages and similar vehicles, pumps and other machinery or appliances used in mining or other industries which it is desirable to protect from the corrosive action of liquids with which they come in contact. The articles which it is desired to render acid resistant can be made entirely of any improved alloy, or can be suitably coated or lined either internally or externally or both with the alloy.

The improved alloy or metallic compound is composed of aluminum, bismuth, copper and silicon or magnesium which are used in the following proportions, more or less: Aluminum, 92 per cent.; bismuth, 2 per cent.; copper, 5 per cent.; silicon, 1 per cent.; or aluminum, 91 per cent.; bismuth, 2 per cent.; copper, 5 per cent.; magnesium, 2 per cent. In manufacturing the alloy the bismuth, copper and silicon or magnesium are placed in a crucible and melted together, and to the resultant alloy, while still molten, is added the aluminum, which has previously been melted.

1,020,512. March 19, 1912. Zinc and Method of Purifying and Improving the Same. A. J. Rossi, Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Company, New York.

This is a process for the purifying of zinc, which is covered by the following claims:

1. The method of improving the properties of zinc which consists in adding thereto while molten, titanium in amount sufficient to result in a final product containing titanium not to exceed 1 per cent.

2. The method of improving the properties of zinc which consists in adding thereto while molten, an alloy containing titanium in amount sufficient to result in a final product containing titanium not to exceed 1 per cent.

3. The method of improving the properties of zinc, which consists in adding thereto while molten, an alloy containing zinc and titanium in amount sufficient to result in a final product containing titanium not to exceed 1 per cent.

4. As a new article a metallic body composed preponderatingly of zinc and containing titanium not to exceed 1 per cent.

5. As a new article zinc containing titanium not to exceed 1 per cent.

1,020,757. March 19, 1912. Metallic Alloy. Geza Hartmann, San Francisco, Cal., and R. J. Busch, Los Angeles, Cal.

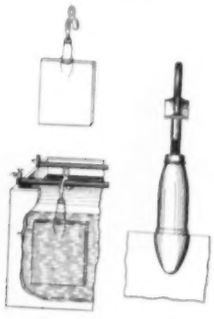
This invention relates to metallic alloys, more particularly such used as solder, its object being to provide a solder for joining together parts of aluminum and also for joining aluminum to other metals.

The invention consists particularly of the alloy composed as hereinafter set forth and of the process of compounding the ingredients of the alloy.

The metallic alloy devised for these purposes is composed of vanadium, aluminum, antimony, bismuth, magnesium and tin, and the best results are obtained when these ingredients are compounded in the following proportion: of aluminum fifteen and one half per cent.; of antimony seven per cent.; of bismuth nine per cent.; of vanadium one-fourth of one per cent.; of magnesium two and one-fourth per cent.; of tin sixty-six per cent.; bearing in mind that the metals to be used shall be of the quality known in the arts as pure.

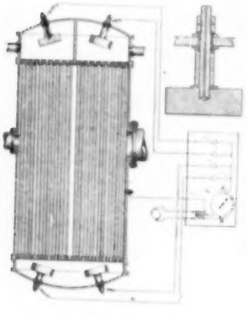
1,019,588. March 5, 1912. Electrolytic Anode. H. E. Beach, Birmingham, England.

This is an invention covering electrolytic anode, as shown in cut, having an enlargement at the center of the upper edge thereof around a screw socket, a current conducting suspension rod having a lower screw-threaded end removably fitted in the socket of the anode and also provided with a hook at its upper end and screw-threads on the body thereof, a non-conducting rigid sleeve mounted over the suspension rod, a non-conducting compressible washer interposed between the lower end of the sleeve and the central enlarged portion of the anode, and a nut engaging the screw-threads on the body of the rod and movable toward and adapted to clamp tightly against the upper end of the sleeve and set up a tight engagement between the lower end of the latter and the washer and the enlarged portion of the anode.



1,020,480. March 19, 1912. Means for Preventing Corrosion of Surface Condensers and Other Metal Structures. P. E. Elliott, Gloucester, Cumberland, of St. Kilda, Victoria, Australia, assignor to Sidney Markell, of Sydney, Australia.

This invention relates to means for preventing corrosion of surfaces of metallic structures or bodies in contact with water or other liquids, and the invention relates more especially to means for preventing corrosion of parts of surface condensers in contact with the injection water. The tubes for the circulation of the injection water and some other parts of such condensers are usually made of brass, bronze or copper, and the partial or complete destruction of such parts as well as of other parts made of other metals through corrosion, and especially electrochemical, or electrolytic, corrosion, has heretofore been a serious obstacle to the successful and economical use of such condensers. This destructive corrosion is especially noticeable in the case of condensers having sea water injection.



Such electrolytic corrosion and also corrosion which results solely from chemical action may be prevented by maintaining by means of the apparatus, shown in cut, between the metallic body or structure and an anode also in contact with the electrolyte, a difference of potential such as to produce an electromotive force tending to cause a flow of current to the metallic body or structure from the electrolyte greater than the electromotive force tending to cause a flow of current from any part of the metallic body or structure to the electrolyte. Such counter electromotive force acts to prevent the flow of current from any part or particle of the surface of the metallic body or structure into the electrolyte, thus preventing electrolytic corrosion, and the current flowing through the electrolyte from the anode to the metal to be protected causes hydrogen to be formed and to collect against the surface of the metal, which hydrogen protects the surface from chemical corrosion.

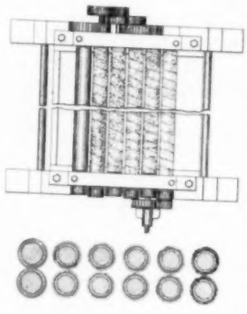
1,020,526. March 19, 1912. Dip-Tank With Automatic Cover. Frederick B. Waibel, Newark, N. J.

The present invention relates to an improved automatic apparatus by which fires in, or which threaten the dip tank so extensively employed in factories, may be prevented from spreading, or completely extinguished, thereby saving the contents of the tank and preventing dangerous explosions.

The object of this invention is to provide an automatic apparatus, as shown in cut, which comprises a suitable stand, preferably made from angle-iron, which supports the tank containing the varnishes, lacquers, and the like, said stand being provided with a cover held in open or locked position by holding means which are secured to the sides of said stand, said means being connected in any well-known manner, preferably by a cable or wire provided with a series of fusible links which when the temperature of the room is abnormally increased, melts, thereby permitting the holding means secured to the sides of the stand which hold the covers in open or locked position to operate and release said covers, thereby closing the tank and preventing the access of air or fire thereto.

1,021,302. March 26, 1912. Detinning-Machine. W. M. Connor, Baltimore, Maryland.

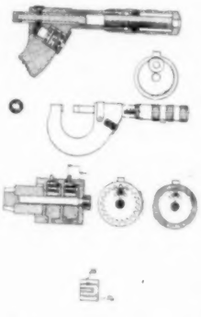
This invention relates to machines for removing the deposit of valuable metal from a base of relatively less value; such for instance as the removal of tin from scrap tin plate or the like, and has for its object the design of a machine of this type whereby the material to be treated is subjected to a thorough scraping action to remove all traces of the plate. This object is obtained by a series of sets of parallelly arranged scraping rolls, as shown in cut, which are so geared that the rolls of each set rotate at a uniform speed while the speed of each set is increased progressively as the material is fed through the machine.



A still further object being to provide means for imparting a lateral motion to the rolls which tends to break joint between the scraping points on the rolls.

1,021,384. March 26, 1912. Micrometer Gauge. M. A. Smith, Woonsocket, R. I.

This invention has reference to a micrometer gauge or caliper, and has for its object to provide a gauge of this character with means whereby the measurement may be read direct by figures positioned by a counting mechanism.



The ordinary micrometer gauge is provided with a graduated barrel over which a coöperating graduated sleeve is designed to work. In reading the micrometric fractions on such a gauge errors are frequently made, as the graduations are small and indistinct and the operator in some cases is obliged to perform a mental calculation in order to ascertain the exact reading.

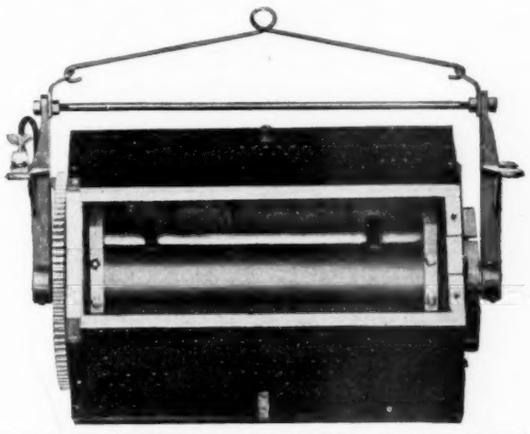
The improved gauge is constructed, as shown in cut, so as to show the measurement by the simplest form of direct reading which indicates tenths, hundreths and thousandths of an inch, or other unit of measurement, so that one unskilled in the use of this gauge will have no difficulty in ascertaining at a glance the exact gauge or thickness of the article measured.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

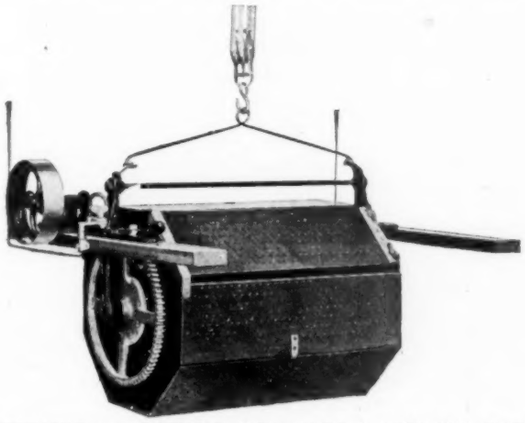
STEVENS' MECHANICAL ELECTRO-PLATER

This machine, shown in the cuts, is adapted mainly for plating small articles, such as screws, bolts, nuts, rivets, washers, and in fact any small articles which are to be plated in large quantities, and in the most economical and labor-saving manner. These machines are furnished for plating nickel, brass, copper, and also for galvanizing. While mechanical platers are not a new thing, this machine is claimed to possess many improvements and advantages over others now on the market, and it has many very important features not found in any other mechanical plater. Some of these are: First: The construction of this plater is



MECHANICAL ELECTRO-PLATER BARREL OPENED SHOWING THE ANODE HANGING FROM SHAFT.

such, that it can be adapted to any plating tank 24 inches wide or over, such as are used in any plating plant, requiring no special tank. It is furnished with end cross pieces which are attached to the top of tank, and which contain the driving mechanism and

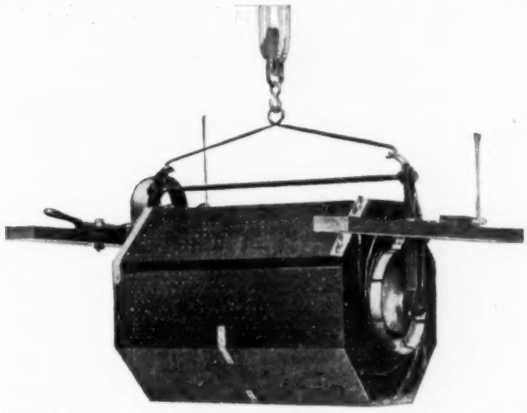


MECHANICAL ELECTRO-PLATER BARREL SHOWING DIVING END AND POSITIVE CONNECTION.

the electrical connections, which are all above the tank, and which obviate the possibility of leaky tanks, as is often the case where the driving mechanism goes through the side of the tank.

Second: A most important feature of the plater is that it requires no anodes in the tank, as there is furnished a special anode which is contained inside the machine in close relation with the articles to be plated. The process of electro-plating, as is well known, consists of depositing metal from the anodes through the plating solution, on the articles to be plated. Other machines have the anodes in the tank outside of the plating barrel, which means that the metal to be deposited must pass through the perforations in the barrel to get to the work, and these perforations must necessarily be small, which greatly impedes the process of depositing and lengthens the time required for a satisfactory plate. Another important feature of this plater is that it has the anode inside the plating barrel, bringing it close to the work, nothing to interfere with a direct deposit from the anode to the parts to be plated, as both the articles and the anode are contained inside the plating barrel.

The result of this construction is, it is said, that this plater will deposit more metal in less time than any other mechanical plater, which has the anodes in the tank, besides saving the cost of these, which is a considerable item. The anode furnished with the plater weighs approximately 45 lbs., whereas it requires from 160 to 180 lbs. of anodes to equip others. This makes a great saving in the cost of installing this plater. The size of the Standard plater is 18 inches diameter and 24 inches long, measured inside. The capacity depends on the nature and shape of the work. It will plate from 75 to 100 lbs. of such articles as washers, rivets,



MECHANICAL ELECTRO-PLATER BARREL SHOWING COMMUTATOR END AND NEGATIVE CONNECTION.

burrs or screws or the like in forty to fifty minutes, and it will work equally as well on one gross of small parts as on a full load. The time of unloading and refilling the machine requires but five minutes.

A hoist is furnished with each machine, by which the barrel can be raised above the tank, the end cross bars remaining attached to top of tank. To operate the machine, put in the parts to be plated, lower the barrel to rest on cross pieces, lock driving gears, and close switch on one end and commutator brush on other end. All connections are simple in construction and easy of access. The barrel should revolve about five revolutions per minute. The electric current enters the machine, at the driving end, through the hollow shaft and connects to the anode which is held stationary in the upper portion of the barrel, passes from the anode to the work in the lower half and is carried out by the cathode wires attached to the inside of the barrel to a segmental commutator at other end, and through a brush back to the negative pole of the dynamo. These machines are well made, simple in construction and easy to operate, and have been thoroughly tested on all kinds of work. The plater is manufactured and sold by Frederic B. Stevens, Detroit, Mich.

ELECTRO-PLATING AMPERE-HOUR METERS

Until quite recently the only method of controlling or ascertaining the amount of metal deposited in a plating bath has been to note the average current flow during any period, and the elapsed time. The product of these quantities gives the approximate ampere-hours of current passed, and from this it is possible to ascertain the amount of metal which has been deposited. For any given metal the amount deposited in an electro-plating bath has a definite and exact relation to the ampere-hours of current which have passed through, this relation being termed its electro-

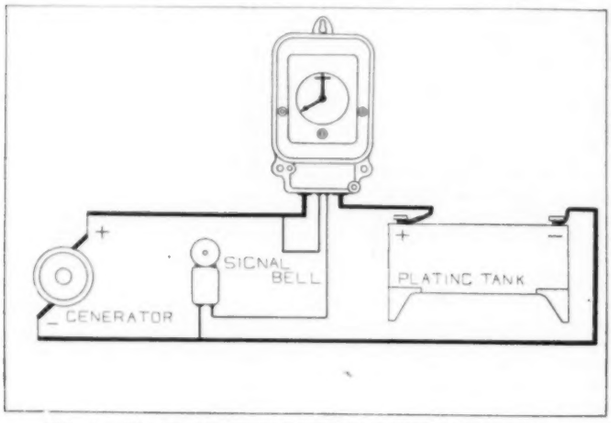


FIG. 1. DIAGRAM OF ELECTRO-PLATING METER AND SIGNAL BELL.

chemical equivalent. These equivalents are given in the following table for the metals, such as silver, copper, etc.:

WEIGHTS OF METAL DEPOSITED IN PLATING.

Metal.	Theoretical Dwt. Per Ampere Hour.	Approximate Actual Dwt. Per Ampere Hour.
Silver	2.58	2.50
Copper (cuprous)	1.522	1.50
Copper (cupric)	.761	.75
Nickel	.70	.70
Gold	1.568	1.54
Zinc	.785	.73

It will be noted that copper has two equivalents according to whether the solution is cupric or cuprous, but as it is very difficult to obtain a cuprous solution on account of the action of the atmosphere, which causes a rapid change, it may be generally stated that the ordinary copper solution used in plating is cupric. For this, as stated in the table, the electro-chemical equivalent is ¼ of a dwt. per ampere-hour. It will also be noted that for zinc there is a difference of about 7 per cent. between the theoretical

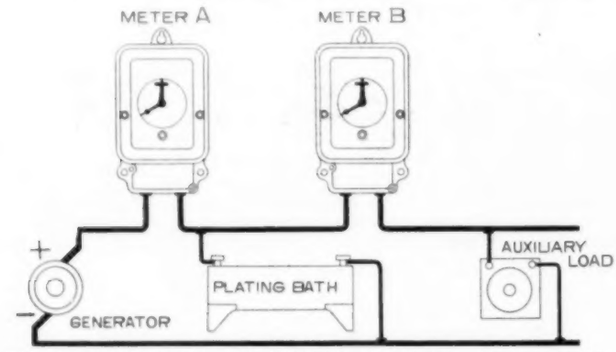


FIG. 2. DIAGRAM OF TWO METERS ARRANGED FOR CONTROL OF GOLD PLATING.

equivalent and the actual weight of the metal obtained, this being due to a considerable loss in the zinc bath not found with other metals.

By the use of the ampere-hour meter manufactured by the Sangamo Electric Company, Springfield, Ill., the former method of watching a clock and ammeter is entirely done away with, remarkable accuracy being obtained simply from the record made by the ampere-hour meter. The standard meter as furnished for electro-plating control has a dial reading in any desired unit weights of the metal with which the meter is to be used; for example, dwt. of silver, grains of gold, pounds of copper, etc. The meter is equipped with a movable pointer, operated by a knob in the middle of the glass window over the dial, so that the pointer can be set at the amount of metal desired for any particular plating operation. For example, if twelve dozen spoons were to be silver plated and required 100 dwt. of silver, the indicating pointer would be set at 100 on the dial, after which the large moving hand, operated by the mechanism of the meter, would be set at the zero point. As current passes through the meter, the large hand moves in a clockwise direction around the dial until it reaches the pointer, in this case set at 100 dwt., when contact is made against a pin in the adjustable pointer, thus operating through auxiliary leads to an electric light or a bell, as a signal. (Fig. 1.)

While the ampere-hour meter has been furnished and is being successfully used with all kinds of plating baths, its widest application has been with silver and nickel. For control of gold plating a very interesting proposition was presented, as the amount of gold ordinarily deposited in any operation is very small indeed, running a few grains only, in many cases. With a meter of even the smallest capacity, 10 amperes at rated full load, it is not possible to calibrate a dial reading sufficiently close for such work, nor in fact to make a meter of sufficiently high accuracy down to very small current rates, such as ½ ampere or even less. The difficulty was overcome by using two meters

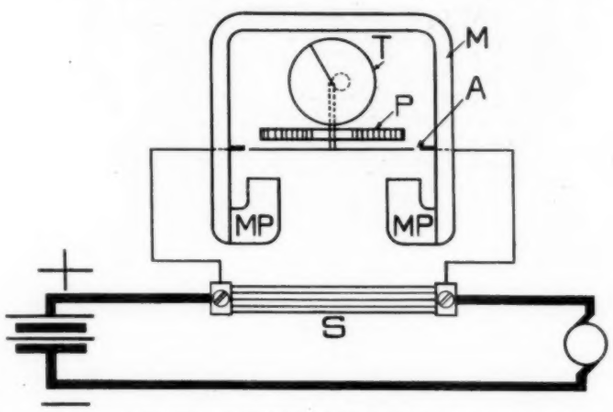


FIG. 3. DIAGRAM SHOWING ELEMENTS OF MERCURY MOTOR METER.

connected as shown in Fig 2, meter A recording both the auxiliary load and the current passing to the gold plating bath, while meter B records only the auxiliary load L. Having the two meters in series as shown, the difference in the readings after any interval will evidently be the amount of gold deposited. With this arrangement, high accuracy has been obtained in gold depositing, and it is particularly interesting to note the two meters can be immediately checked against each other for accuracy by passing the current only through the auxiliary load L, in which case the meters should run exactly together.

While the second meter, of course, introduces some additional cost, yet the price of these meters is so low, particularly in the small sizes, that in important or expensive operations like gold plating, the cost of the additional meter amounts to very little indeed. In fact, the uniformity of deposit obtained and the saving in gold effected by the use of these meters will pay for them in a very short time where there is any commercially large amount of plating to be done.

The principal and construction of the meter, which was very completely described in THE METAL INDUSTRY, April, 1909, is very simple indeed. It consists essentially of a copper disc submerged in mercury, contained within a molded insulation receptacle, and with contacts imbedded in its walls. Further information may be obtained by addressing the Sangamo Electric Company, Springfield, Ill., or M. B. Chase, at 50 Church street, New York City.

SAMPLES FOR ANALYSIS AND TEST

The Henry Souther Engineering Corporation, of Hartford, Conn., have issued a pamphlet, "Notes and Useful Date on the Selection and Preparation of Samples for Analysis and Test," and the information given therein is so valuable and interesting that we have reproduced a portion of it below:

BRASSES, BRONZES, ALUMINUM ALLOYS, ETC.

In general, the methods recommended for sampling steel may be applied to the copper, aluminum and other alloys. Care

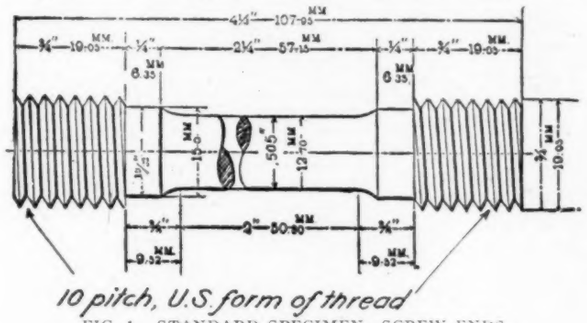


FIG. 1. STANDARD SPECIMEN—SCREW ENDS.

should be exercised when sampling castings to see that flaws, blow-holes and other defects are avoided. Above all, the chips should be kept free from iron drillings, dirt, oil or any foreign substance. One-half ounce of clean chips is a sufficient quantity per sample.

BRASS AND BRONZE CHIPS, ETC.

The best practice for sampling this material of more or less

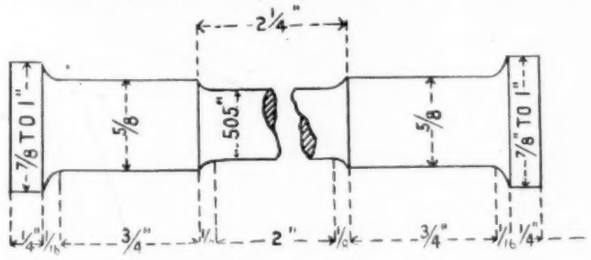


FIG. 2. STANDARD SPECIMEN WITH SPECIAL GRIPS.

varying composition is to melt in a crucible or furnace from one to two hundred pounds of chips, endeavoring to select an average sample. Cast the resulting metal into ingots and drill, sending the laboratory one-half to one ounce of drillings. Carefully clean the drill before using and guard against admixture of iron or steel chips during sampling.

PHYSICAL TEST SPECIMENS.

There are numerous forms of tensile test specimens; those shown below are forms that have been adopted or recommended as standard by such bodies as the U. S. Government, the American Society for Testing Materials and the Society of Automobile Engineers.

This test specimen (Fig. 1) is the accepted standard for bronze, brass and other cast metals, except cast iron and malleable iron.

In order to lessen the cost of preparing the standard form of

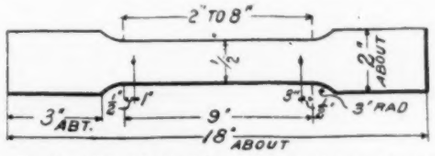


FIG. 3. STANDARD FORM FOR SHEET BRASS AND COPPER.

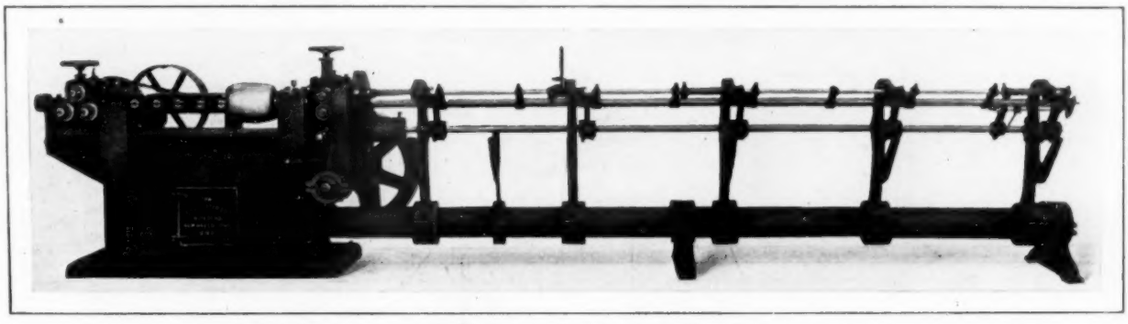
threaded tensile specimen, for bronzes, this company has designed a special holding device which renders the thread unnecessary. A head is machined or cast on the end of the standard specimen, as shown in Fig. 2. Split nuts enclose upon the grip section of the specimen and screw into ball and socket holders.

For sheet brass or copper the form shown in Fig. 3 is the accepted standard.

AUTOMATIC WIRE STRAIGHTENER

The accompanying illustration shows another development of the automatic wire straightener and cutter built by the F. B. Shuster Company, formerly John Adt & Son, of New Haven, Conn. John Adt was the inventor of the first automatic machine for this work, way back in 1865, and during all these years the company have made it their constant study to improve their machines, and increase the production as the demands of the trade developed. The continuous feed is the special feature of this machine, which is fitted with an arbor and dies of such design that after they are once adjusted for a size of wire, coil after coil may be fed through without stopping the machine or re-adjusting the dies. It will be apparent to anyone who has used wire straighteners that this feature means a vast saving of time in the course of the day and a consequent increase in the production. The arbor is longer, has longer bearings, and is fitted with end thrust bearings, giving some oscillation to the arbor during the cutting operation.

Another special feature is a clutch trip, which brings the cutting mechanism directly under the hand of the operator, and this is controlled by means of the handle shown on the front of the machine. The three roll back rough straightener is the same as used on former models, except that it has double grooved feed rolls same as the front feed rolls, and it is connected with the front feed by means of sprocket and chain. As its name implies, it rough straightens the material before it enters the rotary arbor, and it is supplied only with one-half inch and larger sizes, the smaller machines not requiring such a device.

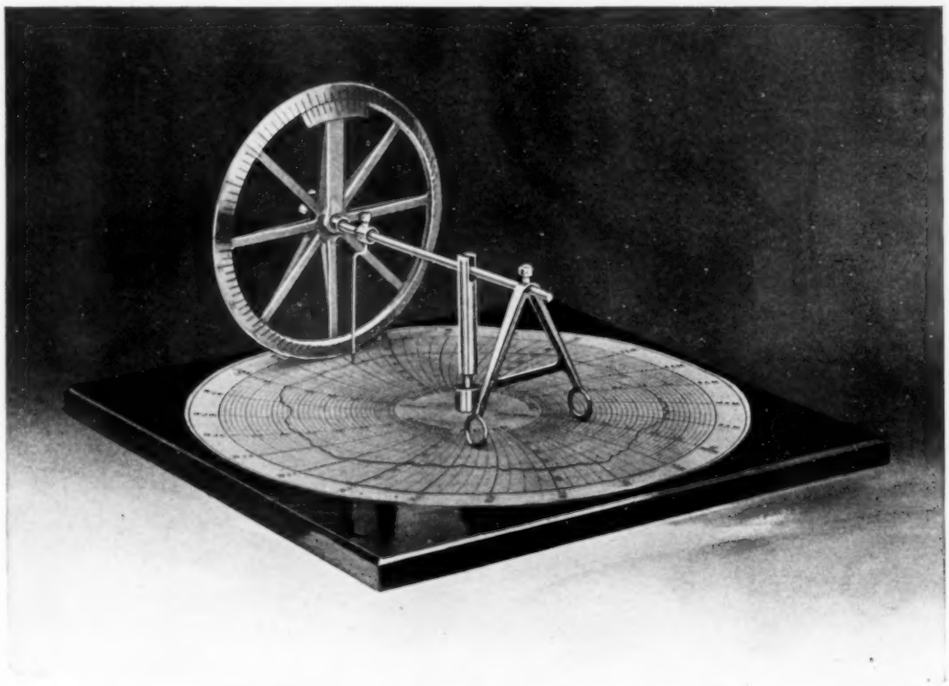


SHUSTER AUTOMATIC WIRE STRAIGHTENER AND CUTTER.

The machine is heavier throughout, but the general plan and operation is the same as on all their other models, and perfectly straight wire and accurate lengths are guaranteed. The machine may be used on gold, silver, brass, cold drawn or rough stock with equally satisfactory results. The cut shows a machine of the ½-in. size, designed for handling ⅝-in. and smaller wire, and cutting to lengths of 12 ins. and shorter, but it is built in all sizes on the same lines, and any length that may be required.

BRISTOL-DURAND AVERAGING INSTRUMENT

For the last 20 years the Bristol Company, Waterbury, Conn., has made a specialty of manufacturing automatic recording instruments for pressure, temperature and electrical measurements, many thousand having been put into practical service. As this class of recording instruments using circular charts has come into general use, there has developed a demand for a simple device to determine quickly the average of the record made on such charts, and the integral value for the whole 24 hours or for the time covered by the record. This demand has been filled by the instrument illustrated herewith, which is based upon a fundamental plan as worked out and patented by Professor W. F. Durand, of Stamford University, and is constructed in accordance with a novel design recently patented by William H. Bristol, president of the Bristol Company.



THE BRISTOL-DURAND AVERAGING INSTRUMENT.

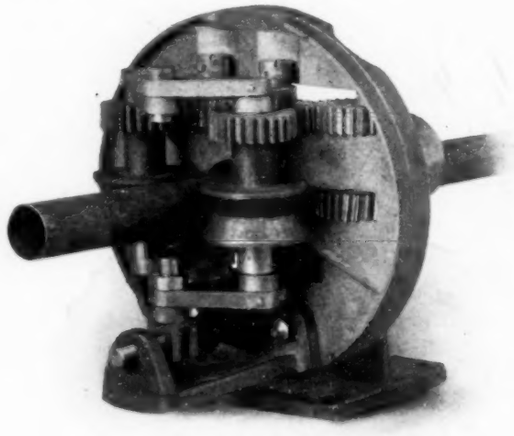
The instrument can be applied for averaging records of any kind on circular charts, having uniform graduations, as, for instance, records of watts, amperes, temperature, pressure, etc. Recording instruments equipped with circular charts are therefore made available for a number of applications for which it was previously thought necessary to use instruments recording on straight lines or strip record charts. Recording differential pressure gauges are coming into use for measuring velocities and volumes of liquids, air, or gas flowing in mains, and this integrating device will prove of value for quickly obtaining total volumes of flow for any given period of time. The simple construction of the instrument is shown in the accompanying illustration. A wooden base with a metal socket is provided for supporting and centering the chart. The socket holds a rotatable pin with a vertical slot at the top to receive the bar which carries the integrating tracer point and triangular support. The vertical groove in the rotatable pin allows the integrating wheel to roll on the chart with uniform pressure due to its own weight.

The integrating wheel is 6 in. in diameter, the rim being graduated into 100 numbered equal spaces, and is fitted with a vernier, which makes it possible to read easily with the naked eye to 0.1 of 1 division on the integrating wheel. The wheel is of such large size that it is not necessary to supply any counting device for the number of revolutions. The number of complete revolutions cannot be more than two, even for a record of maximum size on the large 12 in. charts. To operate the instrument, the thumb and forefinger of one hand are applied to the base of the triangular support, which is moved radially, so as to cause the tracer point to follow continually the record curve, while the chart is turned with the other hand.

AUTOMATIC TUBE POLISHING MACHINE

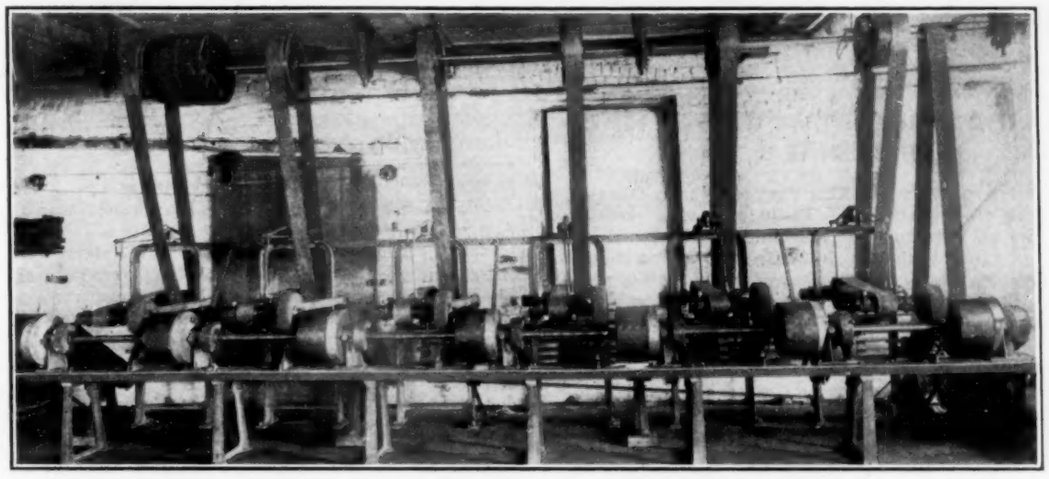
The Robinson Automatic Machine Company, of Detroit, Mich., have recently perfected an automatic polishing machine for tubing and round material. The machine has been built for tube mills and manufacturers who have a large quantity of tubing on which they want to improve the finish for the consumers. The machine is absolutely automatic, as far as the polishing is concerned, as the work is fed in through one end by means of a revolving feed chuck. This revolving chuck has a lateral feed, which is in proportion to the revolutions per minute. One of these chucks is placed between each grinding wheel in such a manner that it will handle the work continuously and bring out a uniformly ground finish. The machine can be made in any size from four to eight wheels.

The machine is built very strong, the frames and chucks are of large proportion, so that there is very little breakage or trouble. The chucks are lined up on a heavy channel and tied across to the main frames so that there is very little vibration and makes the machine practically self-contained. It is made to accommodate a large variety, one machine will take from ⅞ to 3¼ in. tubing without any changes in chucks or rolls, simply by an adjustment in the back of the chuck. The rolls are also arranged with a spring tension so that any unevenness or strain from crooked tubing, etc., would be taken care of by this spring and



SHOWING CHUCK AND FEED OF AUTOMATIC TUBING POLISHER.

not jam in the machine. It is believed the machine will fill a long needed want in this line of work, as it will handle tubing of any length from 4 ft. to 24 ft. long, and there ought to be a large field for a machine of this kind among the manufacturers of stocks for metal beds, sanitary fixtures and users of metal tubing in quantities.



ROBINSON AUTOMATIC TUBING POLISHING MACHINE.

ITEMS OF INTEREST TO THE INDIVIDUAL.

Frank D. Chase, architect of the Western Electric Company, has opened offices in the People's Gas Building, Chicago, for the practice of architecture and industrial engineering, making a specialty of manufacturing plants and mercantile buildings.

Charles L. Mulligan, late of the editorial staff of the Brooklyn *Standard Union*, and for a considerable period associated with the publicity department of the Western Electric Company, has joined the staff of Walter B. Snow, publicity engineer, 170 Summer street, Boston, Mass.

Some recent changes in the personnel of the American Brass Company, of Waterbury, Conn., include the appointment of John A. Coe as assistant to President Charles F. Brooker, and William H. Bassett, the metallurgist, as assistant to General Superintendent Adelburt P. Hine.

George T. Coppins and George H. Graves, secretary and treasurer respectively of the Walworth Manufacturing Company, S. Boston, Mass., were the recipients of twin loving cups on the seventieth anniversary of the founding of the firm. The cups were presented by twenty of the employees of the company, all but two of them have seen more than twenty years' service under these officers.

A. J. Mintie has recently been appointed foreman plater in charge of the plating and finishing department of the Waterbury Brass Goods Corporation Branch of the American Brass Company, Waterbury, Conn. Mr. Mintie in his new position succeeds the late Samuel Lowe, the famous Waterbury horseman, who had held the position for over forty years. Mr. Mintie brings to the company an experience rich in results, based upon a ten-year apprenticeship which he served in the plating rooms of the Waterbury Buckle Company under the guidance of his father.

DEATHS

Frank B. Manville, an inventor and one of the organizers of the E. J. Manville Machine Company, Waterbury, Conn., died at his home in Waterville, Conn., March 29, at the age of sixty-two. Mr. Manville was the inventor of machines for making hooks and eyes and for threading bicycle spools by the rolling process.

Francis Hendricks, senior partner of the firm of Hendricks Brothers, copper manufacturers, died at his home, 10 East Forty-fourth street, New York, March 18. Mr. Hendricks was seventy-five years old, and for forty years had been connected with the copper rolling mill industry. He was also interested in the welfare of the town of Belleville, N. J., where the Hendricks mills are located, and had taken a prominent part in opposing the annexation of that town to Newark, N. J. Mr. Hendricks was a graduate of Columbia University and a member of the Engineers' Club of New York, the Forest Hill Club, the Essex Club and the New Jersey Historical Society. He is survived by a brother, Harmon W. Hendricks, who is now the head of the firm, and by several sisters.

John Toothill, head of the John Toothill Company, casters, rollers and refiners for the trade, sheet block tin and britannia, Brooklyn, N. Y., died at his home on March 15, in his eighty-eighth year. Mr. Toothill was born at Sheffield, England, and came to this country in 1854. He settled at Wallingford, Conn., where for four years he was employed by Simpson & Company, manufacturers of britannia ware, he having learned this trade in England. In 1859 he established himself in business in the same line at Meriden, where he continued for three years, when he removed to New York City. He sold his interests in 1866 and returned to England for a visit, returning to this country one year later with his brothers, and repurchased his old business. He was very successful in business for several years notwithstanding the panic of 1873. He continued active until about eighteen years ago when he returned and was succeeded by his son, John W., who still carries on the business established by him.

He leaves besides his wife, three sons, John W.; Henry, who is in the silver plating business at Rochester, N. Y.; and Michael, who is a britannia spinner; and three daughters, Mrs. Eliza Osborn, of Meriden, Conn.; Mrs. W. J. Webster, of Brooklyn; and Miss Anna Toothill.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

AMERICAN SOCIETY FOR TESTING MATERIALS

President, Henry M. Howe, New York; Secretary-Treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa., to whom all correspondence should be addressed. The society is affiliated with the International Association for Testing Materials and is a corporation formed for the promotion of Knowledge of the Materials of Engineering and the Standardization of Specifications and the Methods of Testing. Meets annually, the time and place being fixed by the Executive Committee.

The fifteenth annual meeting of the association was held on March 28-29, at the Hotel Astor, New York City. This meeting was held so early in the year, because of the coming Sixth Congress of the International Association for Testing Materials, which will be held in this country next September. The meetings held at the Hotel Astor consisted principally of reports from the chairmen of the various committees, which are carrying out the work of the society. The proposed specification covering high brass sheet had been prepared by one of the sub-committees of Committee B-2, but at the last moment it was referred back to its framers for revision, and, consequently, Dr. William Campbell, chairman of Committee B-2, had to report progress as to the work of his committee for the preceding year.

ELECTRO-PLATERS' ASSOCIATION

President, Charles H. Proctor, Arlington, N. J.; Treasurer, H. H. Reama, New York, N. Y.; Corresponding and Financial Secretary, Royal F. Clark; Recording Secretary, Edward Faint. All correspondence should be addressed to the Corresponding Secretary, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d St., on the fourth Friday of each month, 8 p. m.

The regular monthly meeting of the association was held on March 22, with thirty members present. Five active and four associate members were elected. It was decided that hereafter the corresponding and financial secretary should also carry on the functions of treasurer, the office to be known as secretary-treasurer. The following resolution was also adopted: "That when the ballots for the election of officers is prepared, the secretary be instructed to send three to each branch of the association." The following are the nominees who will be voted on at the annual meeting in April: President, Hugh Baxter, C. O. Field, Wm. Schneider, R. H. Sliter, H. H. Smith. Vice-president: Hugh Baxter, C. A. Stiehle, J. A. Stremel. Second vice-president: C. O. Field, William Fischer, C. A. Stiehle. Secretary-treasurer: Royal F. Clark. Recording secretary: H. C. Flannigan, L. H. O'Donnell, J. A. Stremel. Librarian: W. H. Betz, Joseph Minges, J. A. Stremel. Sergeant-at-arms: T. J. Noonan, L. H. O'Donnell, H. H. Smith. Assistant sergeant-at-arms: W. H. Betz, Thomas Kreuder, F. W. Matts, J. A. Straub. Editor-in-chief: A. G. Hoffmann. Trustees: C. H. Buchanan, F. H. Davis, E. W. T. Faint, William Fischer, H. C. Flannigan, L. H. O'Donnell, Benj. Popper, C. H. Proctor, C. A. Stiehle, J. A. Straub.

The regular monthly meeting of the Philadelphia branch was held Friday, March 29. Four new members were added and one application was received. Papers were read by Hugo Hermanns on Brass Solutions and by W. C. Gold on Tripoli Compositions.

At a meeting of the Indianapolis branch held March 29, Dr. W. App Jones, of the Celluloid Zapon Lacquer Company, New York, was the principal speaker. Five new members were received, which with the fifteen charter members makes the membership of the branch twenty. The Hotel Dennison, at which the meeting was held, donated the use of a room for the evening, and J. M. Johnson, of the Hoosier Supply Company, furnished refreshments. The officers of the branch are George Barrow, president, and B. D. Austerheide, secretary.

A branch was formed at Toronto, Ontario, on March 22, through the efforts of Walter F. Barrow, who is one of the leading lights in the plating industry in Canada. A meeting for election of officers and transaction of other business will be held April 12.

A branch of the association was formed recently in Rochester, N. Y. A report from Rochester gives the following account of the first meeting:

"L. E. Sturdevant, with the Celluloid Zapon Company, came to this city, and by hard work helped to organize this branch, with the assistance of Edwin S. Speary, with the Standard Plating Works of this city and Adolph Wahl, with Bastian Bros. The meeting was held at the Hotel Rochester, at which Mr. Sturdevant explained that the object of organizing this branch was to promote the interests of its members in an educational way, to make themselves better craftsmen and to have able speakers present papers on various topics of interest to the trade. The association will meet once a month.

"Active members are designated as those who are or have been foreman platers. Associate members are the salesmen in these lines, who are called the scouts of the association. Honorary members are limited to such chemists who may be of great service by electing them to honorary membership in the association. The Rochester Association will draw in its membership men from as far as Buffalo to the West, Binghamton to the South, and Albany to the East.

"C. V. Haring, with the Ritter Dental Company, was elected president; George H. Hesslink, with the Van Bergh Silver Plate Company, vice-president; Sylvester Gartland, with the Taylor Instrument Company, treasurer; E. J. Kelly, with the Cutler Mail Chute Company, secretary. There were ten charter members at the first meeting. Several new members are promised from outside cities. Only foremen platers are admitted to membership at present, but assistant foremen will be eligible, after a charter has been granted. This charter has been applied for. The next meeting will be held at the same place, at the call of the secretary."

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

President, Theo. Ahrens, Louisville, Ky.: Commissioner, William M. Webster, Chicago, Ill. All correspondence should be addressed to the Commissioner, William M. Webster, 1112 Schiller Theater Building, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City in December of each year. The Semi-Annual Meeting is generally held at Atlantic City or some other Sea Coast town.

Commissioner Webster reports that the association held one of its most successful spring meetings at the Hotel La Salle, Chicago, on Wednesday, March 21, during which reports were

received and acted upon on legislative matters; new members were elected and the reports received during the meeting indicated a rather better outlook for spring trade than was anticipated earlier in the year. All reported the volume of business good and considering the goods that must necessarily move in the next sixty days with the present upward tendency of copper, spelter and other materials will materially better conditions, increase the demand and that the spring will round out with a satisfactory business. Meeting adjourned to meet in Detroit, Mich., on Tuesday and Wednesday, June 11 and 12.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

PROVIDENCE, R. I.

April 8, 1912.

The annual midwinter banquet of the New England Manufacturing Jewelers' and Silversmiths' Association was held in Infantry Hall, this city, on Saturday evening, March 9, and was attended by upwards of 600 members and guests. Business prospects are beginning to show some improvement over what it has been since the beginning of the new year, and there are many indications that before the end of the twelve months constituting the year 1912 the aggregate will be fully up to that of any year in the last decade. The greatest disturbing element in this connection is the unusually large number of failures that are disturbing the manufacturers. Up to the commencement of this month the manufacturers of this city and vicinity have been very heavily hit through financial difficulties of their customers. So far, there has been but comparatively little buying, but the manufacturers have been operating their plants quietly on new lines, and with the advent of spring season will be ready to meet all demands. The new season will open about the first of May, and after the middle of this month the vanguard of the buyers will begin to put in their appearance when, it is expected, the shops will start up with a boom.

Edward Holbrook was re-elected president of the Gorham Manufacturing Company at its annual meeting held at the office of the corporation in this city a few days ago. John S. Holbrook was chosen vice-president; Edward Holbrook, treasurer; John F. P. Lawton, secretary and assistant treasurer; William E. Keyes, assistant secretary, and Fred C. Lawton, superintendent.

The following were the directors elected by the stockholders of which over 44,000 shares out of the total of 50,000 were represented at the meeting: Edward Holbrook, Herbert J. Wells, John S. Holbrook, John F. P. Lawton, Fred C. Lawton, E. Frank Aldrich, Russell Grinnell, Henry S. Sprague and Frank W. Matteson. It was reported that the business for the past year had been close in volume to that of the preceding year. In the bronze foundry it was stated the business has outgrown the capacity and there is at present sufficient orders on the books to keep running full time for more than two years.

Notwithstanding the general cry of dull business during the greater part of the year 1911, the net earnings of the Gorham Manufacturing Company fell only about $50,000 short of the excellent results attained in 1910. The net in that year was a little more than $700,000, while in 1911 net amounted to a few dollars less than $650,000. The year's surplus, 1911, was about $230,000, while the total surplus stands better than $3,000,000. The company's business late in 1911 displayed a large increase, and corresponding gain in earnings, so that the 1912 year began under bright auspices. Full reports of Gorham operations are not made public, but the conservative preferred stock of this, the world's most famous silver concern, is largely held by home investors, and sells on a five per cent. basis, although paying a cumulative six per cent. dividend.

The International Silver Company which owns sixteen plants, mostly in Connecticut, including the Rogers properties, is not in any way a Rhode Island concern, but among its directors is a man who is being talked of as Rhode Island's next Governor, R. Livingston Beeckman. The International publishes full annual reports, and its 1911 operations resulted in a balance, after interest and dividends, of $530,518, as against $693,445 in 1910, a difference of more than $160,000. The Gorham figures do not suffer in comparison with these returns. The total surplus of the International stands at $3,424,106, which is very good.—W. H. M.

ATTLEBORO, MASS.

April 8, 1912.

With the first of April the army of jewelry salesmen started out with full grips. The trade has been passing through a period when no one bought except for immediate necessity, and one result of the slackening up has been the completion of unusually large and varied sample lines. The fiction that somehow or other presidential year should produce less business is still believed in some quarters, but the majority see that it is largely a fiction. There are just as many birthdays, anniversaries and graduations in a presidential year as any other, and the cheerful days of spring and summer are not filled with privations. There is no good reason why trade should fall off, and the manufacturers refuse to proceed on the assumption that the nation will hold its breath because of the coming vote in November.

J. B. Ellis has removed his engraving business to 93 Union street, over the W. E. Hayward Company. The first week in April saw the opening of the new jewelry factory in Plainville, housing Schofield, Melcher & Schofield and Maintain Bros. & Elliot. The H. D. Merritt Company and Mandalian & Hawkins will take additional space in the Manufacturers' building, North Attleboro. Several North Attleboro firms have changed from Rhode Island corporations into partnerships and the resulting loss of taxable property will be appreciated when the North tax rate is announced. Daggett & Clap of Attleboro, formerly a Maine corporation, has reorganized under Massachusetts law as Harvey Clap & Co. The Finberg Manufacturing Company has built an addition to its factory. Out of 1,260 slogans submitted in a newspaper contest, "Attleboro, the Hub of the Jewelry World" was selected by a board of trade committee as the official slogan of Attleboro.—C. W. D.

NEW BRITAIN, CONN.

April 8, 1912.

The important event of the past month in New Britain metal industrial circles was the incorporation of the Prentice Manufacturing Company by George E. Prentice, F. H. Alford and F. H. Johnston. This concern is incorporated for $100,000, and will commence business with a paid in capital of $25,000. Mr. Prentice was for twenty years manufacturing superintendent of the Traut & Hine Company, and resigned that position a month ago. His company has taken a two-year lease on a small factory building in Kensington, three miles from this city, and work has already been commenced getting the structure ready for occupancy by this concern. The product of the Prentice company will be metal garter and arm-band trimmings and all kinds of sheet metal novelties.

One local factory was successful in its attempt to secure from the Board of Relief a reduction from the tax assessment made by the Board of Assessors this year. The Stanley Rule

& Level Company was assessed for over $2,500,000 and appealed to the relief board, which made a $300,000 reduction. Robert M. Smith, for twelve years foreman of one of the important departments at the Stanley Works' local factory, has been made superintendent of that company's auxiliary plant at Niles, Ohio, and has moved there with his family. An addition is being contemplated to the Niles plant by the officials of the Stanley Works.

Progress is being made by the contractors who are building the new structures for Russell & Erwin and the Landers, Frary & Clark Company. The exterior of the concrete, five-story structure for the former concern is nearly finished, and work on the interior will soon commence. The seven-story factory and office building being erected for the latter concern is nearly finished, practically all that remains to be done is the installing of machinery and office furniture. The offices of the company will occupy the entire top floor of this building, which is of the most ornamental construction of any of New Britain's factory buildings. Without manufacturing a single trolley wheel in the building, officials of the Universal Trolley Wheel Company, who had chosen East Berlin as a location for their concern, have ordered the removal of the machinery to Northampton, giving their reason as difference in cost of power. East Berlin people refused to come up to the expectations of the company's officers when the matter of buying stock came up.

New Britain manufacturers have taken up an agitation in favor of a barge canal to Middletown, a distance of twenty miles, and local people are enthusiastic in the matter. Should the canal be constructed, as local people are anxious it shall be, within a few years, New Britain will be given water communication with all points on the coast that are accessible by barge from the mouth of the Connecticut River. "From New Britain to the Sea" is the slogan that has been taken up by local merchants and manufacturers who are boosting the project.

The New Britain Machine Company has taken out a building permit for a four-story factory addition, to be of concrete construction, 144 by 50 feet in size. Old buildings are being torn down to make room for the new structure, which, when completed, will be used in connection with this concern's manufacturing business.—A. L. M.

MERIDEN, CONN.

April 8, 1912.

In view of the fact that the year we elect our National President is generally conceded to be poor in a business way, it is extremely gratifying to report that so many of our local factories are pushed to the limits of their capacities in order to fill their orders. Superintendent W. S. Pain, of the Aeolian Company, reports that the concern never was so busy before at this time of the year. The music department is being worked four nights a week and the company is still behind with its orders.

The Wilcox & White Company are now working on orders that were left over from last year. Orders are coming in fast and Secretary Robert W. Carter stated that it will probably soon be necessary to run some departments of their factory overtime. Superintendent J. K. Williams, of the Meriden Fire Arms Company, stated that that company was working full time in all its departments and that business was far better than in previous years. This company sends most of its products to the Sears-Roebuck Company, of Chicago. Mr. Williams says that there were 405 men in the employ of the company at an average weekly wage of $13.11.

The Meriden Press & Drop Company, a new concern, has recently acquired possession of the plant of the late A. H. Merriam on State street, and will manufacture the many models of Merriam presses. They will make dies, tools and do a general line of repair work. Henry M. Doolittle, president, is in charge of the manufacturing end, and C. Howard Tryon, treasurer, is the business manager. The officers of this company believe that many articles worthy of manufacture are never produced because of lack of money or opportunity. They stand ready to arrange for such articles a fair basis for manufacture, and also, if desired, to arrange for marketing in connection with their own products.

The Benziger Company, manufacturers of German silver pewter, copper and brass art goods has received an offer to move its plant to Chicago, Ill. William Benziger, general manager of the company, stated that the inducements offered were excellent and thought likely that the business would be moved to that city before long.—F. O. V.

ALBANY, N. Y.

April 8, 1912.

Albany is not as large a manufacturing city as it used to be. Many of the large factories left here during the past ten years. The big stove factories are not doing as much as they used to and all of these concerns had plating plants in connection. Other concerns have been locating here and more are to follow as the Chamber of Commerce has been getting busy and presenting the advantages of this city to the outside public. The facilities for shipping here by canal, rail and the Hudson River are unrivaled and there is no reason why the manufacturing should not be greatly extended. This is considered, however, a residential city and political headquarters.

Rathbone, Sard & Company, large stove manufacturers, it is reported, have laid off some 300 hands in the three shops. Of late they have been making many gas stoves.

The Fitzgerald Brass Foundry, Pleasant street near North Pearl street, make locomotive castings and will enlarge the works considerably, so as to make castings for electric purposes.

The Capital City Plating Works North Pearl and Tivoli streets, have put in a new silver plating plant, do all finishes, jobbing work and are well equipped to do work of any size. They do no manufacturing and were here five years ago. Joseph Bertrand, electro-chemist, does the gold plating himself, he is the proprietor and he bought out the interest of his late partner, William Tanner. Joseph Bertrand, Jr., has charge of the office. William Tanner, late with the above mentioned firm, bought an interest in the Guilderland (N. Y.) Plating Company, who make piano hardware. The Troy Nickel Works, on Van Rensselaer Island, make stove trimmings and hardware specialties. As the stove trade is slow, this business is also affected Were closed down during the holidays but started up after that. Also make all kinds of handles, of wire and nickel plate.

William H. Friedman, who was at 17 Liberty street, making metal novelties and manicure lines, nickel plated, has moved to the Union Trust building, Harrisburg, Pa. John H. Sutliff, who took the place Friedman vacated, makes metal polishes. T. J. Sullivan, 22 DeWitt street, brass founder, says he is getting his share of the trade.

The George H. Thatcher Company, of Learned and Thatcher streets, are putting on the market their new sectional and dumping grate, also their automatic mechanical smokeless furnace. They have a contract for work on the new Capitol power plant.

The Cox Brass Manufacturing Company, Van Woert street, will erect a two-story addition to their plant, to be 100 x 35 feet in size and will build a new foundry at a total cost of $10,000, not counting equipment. This firm are very busy making automobile wind shields. They expect to greatly enlarge the capacity and are getting ready for a big business.

George B. Withers, of 63 Rensselaer street, makes all kinds of harness and carriage name plates of nickel, brass, gold or silver and has been 53 years in business. E. Leary, 13 Church street, has been in the plating business 40 years and is now taking it easy. He gave up manufacturing and does plating only for the jobbing trade. He says the automobile drove out the carriage trade and the airship will get the strangle hold on the automobile. The Kirtland Electric Construction Company have put in a new plating plant at 29 Church street.

The Empire State Brass Foundry at 176 Broadway, owned by Thomas H. Felstead, does brass, bronze and aluminum work of all kinds. He is working on a new device for carbureters on automobiles and is making a casting for a new patented article, which is a metal piece gotten up by a doctor to take the place of a wooden splint for a broken arm. It will be made of aluminum. Mr. Felstead has put in an electric motor, enlarged the furnace and done away with gasoline. The standard Compound Company, Van Rensselaer Island, are making dry core compounds and foundry oils. Have been running half time, but had a good year during 1911. The foundries have not been buying heavily and can grind out more than they can sell. H. W.

Antemann, 23 James street, will have to move his jewelry factory, as the building has been sold. When he moves this year he will probably also make enlargements and take up new lines as well as wanting equipment. William Antemann, of 29 North Pearl street, manufacturing jeweler, will move to a better location.—H. S.

NEWARK, N. J.

April 8, 1912.

W. A. Wirth and Company have put in surfacing and edge-grinding machines at their optical quarters on Broad street, near Mechanic street. B. A. Keller is in charge of the grinding department. The Newark Museums at the Public Library have been increasing their display every year. They bought the Rockwell exhibit of Japanese art for $10,000 and are showing a fine line of bronzes, gold, silver and platinum lines, as well as old silver, art treasures and pottery.

Since the C. E. Fenniman Company, making silver goods, moved from New Rochelle, N. Y., to 354 Mulberry street, they have incorporated and largely increased their plant and output. They have their own factory building, and the incorporators are C. E. Fenniman, R. B. Thomson and W. B. Johnson.

George Gebhard has bought the interest of his partners, J. and H. Neiderman, in Gebhard and Company, manufacturing jewelers of 109 Oliver street. Earl H. Sheppard, of Maiden Lane, New York City, has taken an interest in the firm and will do the selling. The Board of Trade have moved to their own building at Broad and Mechanic streets and have adopted the slogan, "Made in Newark," which they request all manufacturers to use on their goods and stationery. Curtis R. Burnett, of the American Oil and Supply Company, is president of the board and also of the Newark Association of Credit Men. The manufacturing jewelers, silversmiths and metal working trades take great interest in both organizations.—H. S.

CLEVELAND, OHIO

April 8, 1912.

Trade with the dealers in metal products in this territory during the past month has been fairly satisfactory, although it is believed that with the opening up of other lines of spring business conditions will improve somewhat. The automobile business in Cleveland has seldom been in better shape and the factories here expect an unusually heavy demand for stock this year. Business with the plumbing supply houses also promises to be brisk, although these institutions have felt the effect of the long drawn out winter during which time building operations have been at a standstill. There promises, however, to be an unusually heavy year in building in this territory and reports from other cities indicate that there will be a strong call for fixtures during the year of 1912.

A number of the brass foundry companies are anticipating enlarging their plants during the coming year to meet new demands which are being made upon them. During the past month preparations were made by the Gas Fixture Company, now at East 4th street and High avenue, to take over the plant of the United Brass Manufacturing Company at 3844 Hamilton avenue. The deal will result in the combination of the plants and the erection of a factory for the manufacture of both gas and electric fixtures as well as the line of plumbing fixtures now being made by the United Brass Manufacturing Company. The gas fixture company has worked up a good business and among other patrons has recently served the United States Government by installing fixtures in a number of new federal buildings.

An unimportant strike took place during the past month at the plant of the Aluminum Castings Company, 6205 Carnegie avenue, when 30 core-makers went on strike in sympathy with the strikers in Detroit. The strike did not cause the company any particular inconvenience. Phillip Frankel, secretary of the Cleveland branch of the National Metal Trades Association reported during the past month that business conditions among the metal trades at present is far better than it was a year ago. There has been a particular improvement since the 1st of January, particularly in automobiles and automobile parts. It is reported that there is not an excess of mechanics indicating that men in this industry are well employed. It is believed by the manufacturers here that there will not be much labor difficulty this spring. The association is arranging to enter into a campaign of efficiency by the inauguration of a scheme to have superintendents and foremen of various establishments visit the different plants of associate members during the year, thus absorbing new ideas about their business.

During the past month an employee of the Zerk Manufacturing Company, auto parts, Columbia building, was arrested on a charge of damaging the firm's plating department by the pouring of a carboy of ammonia into the big pickling vats. It is claimed that the plating solution and the vats were injured to an extent of between $2,000 and $3,000. According to Zerk the employee had been experimenting for several months to find a better formula of solution for the work. When the formula was perfected he was presented with a prize. When the company asked for the formula it was refused, the employee stating that he would demand permanent employment by the Zerk Company. The man's discharge followed shortly afterwards. It is claimed that before leaving he proceeded to do the damage charged against him.—S. L. McM.

DETROIT, MICH.

April 8, 1912.

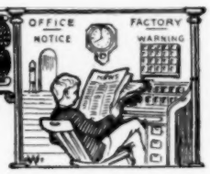
No material change has occurred in the brass and aluminum trade in Detroit during the last four weeks. The different manufacturers report conditions good and that they have a large number of orders. All, however, complain of the terrible handicap in transportation facilities. Never before in the history of the city have such conditions prevailed. Brass and aluminum manufacturers, as well as every other line in this city, are sorely pressed. Not only are they handicapped in obtaining cars for shipping out their products, but they also have great difficulty obtaining coal. Many plants are running from day to day expecting at any time to be forced to close for lack of fuel. The Board of Commerce for some time has been working on the problem, but reports the railroad companies are deficient in equipment and motor power. Thousands of cars loaded with coal and various other products urgently needed in Detroit are strewn between Toledo and the Detroit freight yards. Both the Detroit and Toledo yards are fearfully congested, and at present no prospect of improvement is in sight. So bad have become conditions that the Cadillac Motor Car Company is considering the question of building another factory in some city where the railroads can handle its products, but it would be difficult to find such a place in the Middle West. This is the busy automobile season, and manufacturers are pressed to the limit to obtain freight cars in which to ship their products. The brass and aluminum and automobile factories are all bravely facing these conditions, but the managers say that patience sometimes ceases to be a virtue.

The railroads in discussing their difficulties declare they are doing their best, and at the same time promise relief in the near future. They lay the trouble to the unprecedented growth that Detroit has experienced during the last five years.

Brass and aluminum molders at the Aluminum Castings Company plant and the Sherwood Brass Foundry have struck for an increase in wage. The points at issue are nine hours work with ten hours pay and a minimum scale of $3.25 a day. The Sherwood company declares that it already is paying the scale so the nine hour day is the question with that plant. The men say they will fight the proposition to a finish while the employers declare they will never give in. Considerable rioting in the vicinity of the plants have occurred since the men walked out. Many employees of other plants not in this line have been assaulted and beaten, the pickets thinking they were strike breakers.

The brass and aluminum industry as it affects the automobile trade is at a high water mark. These plants are working full handed and overtime in order to keep up with the great demand for automobile parts. Concerns manufacturing plumbers' supplies also are busy and have a large amount of business in advance. The plants are operating full handed and probably will continue in this way indefinitely. The coming presidential election seems to have no material effect on conditions in Detroit.—F. J. H.

TRADE NEWS



TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

The Bristol Company, manufacturers of measuring instruments, Waterbury, Conn., are adding another story, 50 by 70 feet, to one of their buildings.

The Ellwood Ivins Tube Works, manufacturers of seamless tubing, Oak Lane Station, Philadelphia, Pa., report good business and running full time.

It is reported that A. B. Depuy, Collingswood, N. J., has developed a process of plating aluminum, either pure or in alloy, so as to have a copper, silver, gilt or gun metal finish.

The Wallingford Company, Inc., manufacturers of silverware and novelties, Wallingford, Conn., are having plans prepared for a new four-story brick factory, 36 by 156 feet.

The Doehler Die Casting Company, Court and Ninth streets, Brooklyn, N. Y., are about to erect an addition to their present plant which will be of reinforced concrete, seven stories, 50 by 100 feet.

The Chase Rolling Mill Company, Waterbury, Conn., announces under date of March 25 that they have withdrawn their prices on brass sheet, rod and wire. Inquiries for prices are solicited.

The Ruggles-Coles Engineering Company, New York, have recently shipped some large tanks of Monel metal to a prominent western chemical works. The construction included Monel metal sheets, rods, castings and rivets.

The Abbott Ball Company, manufacturers of steel balls, burnishing barrels, etc., Hartford, Conn., are constructing a new factory at Elmwood, a suburb. The building will be of brick, steel and concrete construction, two stories, 40 by 100 feet.

The Williamsville Buff Manufacturing Company, Danielson, Conn., manufacturers of the well-known "A-1" brand of cotton buffs, announce that they are now in a position to fill orders for Turkish emery and solid emery and corundum wheels.

The current trade press reports that the Holmes & Morris Manufacturing Company, Syracuse, N. Y., have taken over the Precision Manufacturing Company, merging it with their own business of making a special white metal, die casting material.

It is reported that a company to be composed largely of local capital will be organized at Marion, Ind., to manufacture brass and copper radiators for automobiles. The proposed company would take over a big brass foundry at Chicago and employ sixty men at the start.

The Keystone Bronze Company, with a plant at Pittsburgh and New Brighton, Pa., have put in new machinery at the former plant, to manufacture brass, copper, bronze and aluminum castings. They will be able to turn out and finish castings of 10,000 pounds in weight.

The Buffalo Copper & Brass Rolling Mills, Buffalo, N. Y., state that owing to the rising price of copper, metal goods manufacturers are placing with them much larger orders than usual. They state that the mill is now producing a larger output than ever before and that the demand continues to be brisk.

Walter C. Gold, 235 Race street, Philadelphia, Pa., is doing a large business in furnishing polishing and grinding materials, platers' supplies, etc. He is selling agent for the Keystone emery wheels and is in a position to furnish any other kind of polishing, grinding and plating materials that may be required.

George E. Prentice, formerly manufacturing superintendent of the Traut & Hine Company, New Britain, Conn., has organized a company in that city, with a capital stock of $100,000, to manufacture special tools, small metal goods, etc. Machinery is now being placed in their factory and it is expected that operations will be begun within the present month.

J. A. Rose has recently built and equipped a brass supplies foundry at Hastings, Neb., and is prepared to cast brass for all kinds of work. The plant also contains a machine shop and novelty works. The Rose washer and gasket cutter will also be manufactured here as well as a patented meter connection and set of drift punches. The factory, which employs twelve men, is 24 by 90 feet.

United States Consul James E. Dunning, of Havre, France, reports the creation of a copper exchange in that city to take the place of the indirect buying through London where the French have heretofore had to deal. Latham & Company, of Havre, and influential house with American bank connections, would like to hear direct from Americans interested and can give any required assurance as to responsibility.

The Meaker Company, Chicago, Ill. report a big sale for their Platers' Magnet which was brought out several years ago. This magnet is said to have proven to be very proficient for the work intended. The magnets are made four feet in length and weigh seven pounds ready for shipment. They are guaranteed to lift fifteen pounds, and will bring up anything from the bottom of a tank that could possibly be there. The handles are made long so that the operator need not get his hands in the solution.

The Sheeler-Hempsher Company, brass founders, Philadelphia, Pa., are taking estimates on plans for extensive additions to their plant which will double their molding floor space and provide additional facilities for shipping, cleaning and storage of patterns. The additions include a one story basement building, 26 by 52 feet for metals and a 26 by 100 foot addition to the foundry building. The company are considering the purchase of power equipment and also additional machinery for finishing purposes.

Beginning with the June issue "The Merry Molder," a house organ issued by the Osborn Manufacturing Company, Cleveland, Ohio, will award each month a prize of ten dollars in cash for the best paper on foundry practice written for "The Merry Molder." The contest is open to all shop readers of the paper, superintendents, foremen, molders and laborers. The paper must discuss some example of improved foundry practice in which the improvement has been accomplished by using an Osborn machine or accessory.

The Michigan Copper and Brass Company and the Detroit Copper and Brass Rolling Mills, both of Detroit, Mich., have complained to the Interstate Commerce Commission of the rates on raw copper from points in the northern peninsula of Michigan to Detroit. It was said that the rates are preferential to eastern manufacturers at Bridgeport, Ansonia, Torrington and other points. It is also claimed that the differential between the Detroit rate and the New York and eastern rates is unjust. Several railroads are named as defendants in the complaint.

The Ajax Metal Company, Philadelphia, Pa., report through G. H. Clamer, second vice-president and secretary, that they have purchased a plot of ten acres in Philadelphia, having connections both with the Pennsylvania Railroad and the Belt Line Railway. It is the intention of the company to erect a smelting plant, plans for which are being prepared, and they expect to have it in operation by the latter part of the summer. The building now occupied by their smelting department will be equipped for a

foundry, giving the company more than double their present capacity.

The Turner Machine Company, 3632 North Lawrence street, Philadelphia, Pa., have filled within the past sixty days a number of export orders, including Turner Cock Grinders to Hanover, Germany; London, England, and to Buenos Aires, Argentine Republic; and sprue cutters to the Argentine Republic and to Canada. They also shipped recently two cock grinders to the Westinghouse Air Brake Company, at Pittsburgh, Pa., and one to Cleveland, Ohio. The Turner Machine Company, in addition to making cock grinders and sprue cutters, also manufacture molding machines, sand sifters, flasks, etc.

The Pittsburgh Architects Bronze Works has recently been formed by Lewis R. Schulz and associates, and a large plant installed for the manufacture of architects' bronze, at 4017 Liberty avenue. This plant is now working under an improved system of manufacture, making an indestructible, seamless and ornamental metal fire-proofing for lighting fixtures for direct and indirect lighting purposes, porcelain lined copper utensils, metal ceramics, etc, Mr. Schulz was formerly president of the Electrolytic Art Metal Company and vice-president of the Arnold Monophase Electric Company, both of Trenton, N. J.

An important trade mark suit was argued recently before Judge Hazel of the United States District Court, New York City. The suit points out the alleged infringement of the F. & M. Weintraub, De Salvo Brothers and Schmidt & Sons of New York, of the Gorham Manufacturing Company's trade mark of an anchor and the letter G. Evidence and testimony in the case was extremely voluminous and after both sides had reviewed the case at great length Judge Hazel announced that he would reserve decision and his remarks indicated that it would be at least three or four months before he could take up the matter.

The S. A. Day Manufacturing Company has succeeded to the business of McLaughlin & Co., 10-12 Pearl street, Buffalo, N. Y., which was originally the Kortum Manufacturing Company, and is prepared to make prompt delivery on orders of all kinds for plating and polishing supplies. They make a specialty of buffing compositions, emery, buffs, polishing wheels, etc. Mr. Day, who has assumed control of the new company, was formerly the Cleveland, Ohio, representative of E. Reed Burns, Brooklyn, N. Y. The new company is now improving its facilities and announces that it is in a position to furnish high class supplies of all kinds at reasonable prices.

The Mauston Aluminum Company, manufacturers of aluminum goods and specialties, Mauston, Wis., notice of whose incorporation is published in this issue, report that they are at present located in the building formerly occupied by the Mauston Boat Company, but have purchased a plot of land with 178 feet of railroad frontage and expect to build a two-story fireproof factory as soon as the weather permits. Walter S. Marvin, secretary, reports that they are fully equipped for the making of all their own dies and have installed several large toggle and redrawing presses. They will manufacture stamped and spun ware. The specialty of the company will be cooking utensils and some novelties.

An extremely interesting collection of artistic metal work, bronzes from the Orient, remarkable jewelry, jades, ivories, swords and armour, with numerous other art objects and paintings, was exhibited from March 3 until April 8 at the Anderson Galleries, New York. The collection is owned by Mr. John L. Graves, of Boston, and is to be sold. The most notable bronzes shown are those made of the bronze and gold composition known as "the snow of heaven" and the examples are cast and finished with the skill of the renowned Chinese artists. The numerous swords from Japan, and the historical armor, form a group of marvelous works in metal, and the genuine antique busts of marble, set with heads of bronze, are of great interest.

The British Aluminum Company, Limited, sent out a pamphlet on the subject of the aluminum drying pulleys which have been adopted by the American Tool Works Company, Cincinnati, Ohio, for use on their 36, 42 48 and 60 inch heavy pattern planers. While this is a somewhat new departure in planer construction, pulleys of this metal have been applied to a number of machines in the company's shops to overcome certain conditions existing there. It was not the intention at first to make these pulleys part of the standard equipment, but the results obtained were so satisfactory and so much better than were expected that it was decided to use them on the large planers instead of the regular cast-iron pulley. Some of the advantages derived from the use of this metal are light weight, long life of the belts and the development of less momentum.

The Eureka Pneumatic Spray Company, 276 Spring street, New York, announce that they will soon have on the market a complete line of atomizers. For the past twelve years this company has made air brushes and sprayers for applying all kinds of liquid materials, but they recently decided to extend their line to include barbers, medical and perfume atomizers, also nebulizers, disinfectant sprayers and atomizers. They state that their new line will be a decided improvement over everything in the market as regards design, construction, efficiency, convenience and attractiveness. They intend that their goods shall show a great improvement over anything previously manufactured and purpose giving special attention to the finish of their new line, and to use a much higher grade of glassware than is now found in appliances of this kind. Their representatives will introduce these new atomizers to the trade during the coming summer.

C. Wigtil, chief engineer of the Watson-Stillman Company, manufacturers of hydraulic machinery, New York, reports the following tests on Victor Vanadium bronze:

A tube of Vanadium bronze with an inside diameter of 1.25 inches and an outside diameter of 1.408 inches and a length of 4 inches was subjected to a hydraulic pressure of 10,000 pounds per square inch. Under this pressure the tube stretched to an outside diameter of 1.422 inches, equal to a strain in the walls of the tube of 41,500 pounds per square inch. The hydraulic pressure on the tube was then increased to 13,000 pounds per square inch and under this increased pressure the tube stretched to a diameter of 1.467 inches. The tensile strength from the latter test amounts to 53,600 pounds per square inch. Under both of these tests not a drop of water leaked through the metal, and the tube is very likely good for a still higher pressure, if means had been available for producing the pressure.

Newark (N. J.) is to hold a great industrial exposition under the auspices of the Board of Trade, May 13 to 25, to accelerate the industrial, commercial and educational interests of the city. Displays will be made in the First Regiment Armory and grounds, the building being one of the largest and best adapted to exhibition purposes in the United States. It is claimed that one hundred thousand different articles are manufactured in the three thousand shops of the Newark industrial district, the diversity being proportionately greater than that of any other manufacturing district in the country. Not only will the products of Newark's factories be shown, but also the processes of manufacture. There will be many special features of an entertaining and educational nature, including a series of lectures on the industrial development and opportunities of Greater Newark. The committee announces that through the medium of the exposition it wishes to draw the attention of the nation to the fact that Newark is now the fourteenth city of the country in population and the eleventh in manufacturing, and that it is enjoying a period of greater prosperity than ever before in its history. For many years the city has been widely known as the nation's leader in the manufacture of gold jewelry, while its high rank has long been recognized in many other industries.

METAL FIRMS CENTURY OLD

Metal firms a century old are not common in the United States, but this year two houses celebrated a hundred years of continuous business and a third firm announces that they were established in 1789, giving them the age of one hundred and twenty-three years.

The firm of Richards & Company, 200 Causeway street, Boston, Mass., have issued the centennial edition of their catalog, they having been established in 1812. The catalog contains useful tables and information to users of metals in all forms.

To celebrate their hundredth anniversary the firm of Bruce &

Cook, 190 Water street, New York, have issued a handsome illustrated catalog with portraits of the founder of the firm and his successors. It also contains an historical record of the personnel and changes which have taken place in the firm's management. The house of Bruce & Cook enjoys the distinction of being in business for one hundred years on the same spot. They sell metals of all kinds.

Probably the oldest strictly metal house in America is the firm of Nathan Trotter & Company, 36 North Front street, Philadelphia, which was established as a firm of tin merchants in 1789 by William Trotter. In 1815 the firm's name was changed to Nathan Trotter & Company, which title has been maintained since the date of founding, and the business is still managed by members of the Trotter family. The house has been selling metals at their present location for the past eighty years and they have a number of old papers relating to their affairs which date back as far as 1799.

Besides the strictly metal houses mentioned above it is stated that there is located at Lancaster, Pa., a firm of George M. Steinman & Company, hardware merchants, which sells metals and which was established in 1764. They are still doing business on the same site. The N. & G. Taylor Company, tin plate manufacturers, of Philadelphia, were established about 1810.

ELECTIONS

The Newburyport Silver Company, manufacturers of sterling silverware, Keene, N. H., recently elected the following officers: John Currier, president; Caleb Stickney, treasurer and manager; George E. Collins, clerk; Leonard N. Kent, Richard T. Noyes and the officers are the directors. The company report that business is booming as their orders for March were 100 per cent. ahead of any previous March.

The annual election of the Metal Exchange of New York was held on April 1 and resulted in the election of the "members ticket" over the "regular ticket" by a vote of 58 to 52. There was no contest for the offices of president and treasurer, James E. Pope and Robert L. Crooke, being re-elected. A. B. Hall was elected vice-president, and the following were chosen as members of the board of managers: B. Hochschild, of the American Metal Company, Ltd.; H. W. Hendricks, of Hendricks Bros.; G. E. Behr, of Behr & Steiner; Emil Baerwald; Edwin Groves, of Jas. W. Phyfe & Co.; W. Parsons Todd, of the Quincy Mining Co.; Erich Benjamin, and J. H. Lang, of L. Vogelstein & Co.

J. Langeloth, C. J. Marsh, E. J. Keane, P. R. Jennings and Humphrey D. Bond were elected to the arbitration committee, and C. H. Bolles, Jr., Fred Steiner and I. J. Louis were chosen inspectors of election.

REMOVALS

The Daggett Galvanizing & Plating Company, gold, silver, brass and nickel platers, Syracuse, N. Y., have moved from the Industrial building to 320 North Clinton street, where they have larger quarters.

The Meaker Company, whose plant is now on Elizabeth street, near Fulton, in Chicago, Ill., will move shortly into their new building which is practically across the street from their present plant on the corner of Elizabeth and Fulton streets, where they will have one of the most modern plants in the country for the work intended, that of galvanizing, and the manufacture of galvanizing machines and equipment. This new plant will include all of the best features taken from the experience gained in designing and installing handling methods for numerous manufacturers, combined with the ideas directly gained from actual experience in the firm's twelve years of trade galvanizing. This company reports a big business in job galvanizing, and it is claimed is today the largest galvanizing plant in America. The company has also been growing very fast in the manufacture of galvanizing outfits, and makes a specialty of a self-sustaining galvanizing solution. Among their many customers are most of the large nail and bolt manufacturers of the country. Some sixty large plants have been equipped in different parts of the United States and Canada.

CHANGE IN FIRM

The Reed-Prentice Company has been organized at Worcester, Mass., with a capital of $2,500,000, effecting the consolidation of five firms manufacturing machine tools or their parts. The firms taken in are the S. E. Reed Company, Prentice Brothers Company, Reed Foundry Company, Reed & Curtis Machine Screw Company and the Crompton Associates, the latter a real estate company holding the property. Over one thousand hands are employed in the mills.

DISSOLUTION OF FIRM

The firm of Moyer & Gulbrandson, manufacturers and jobbers of electro-plating, polishing and buffing supplies, Detroit, Michigan, has been dissolved. D. B. Moyer has secured complete control of the business, and will conduct it in the future.

FIRES

The Anderson Chemical Company, 92 William street, New York, whose distilling department at Wallington, N. J., was damaged by fire recently, announce that their stock of soluble cotton was not affected by the fire and that they are taking care of all orders and contracts in this department.

The plant of John C. Wiarda & Company, manufacturers of chemicals, Brooklyn, N. Y., was destroyed by fire on the morning of March 10. The fire originated in an adjoining iron yard and spread to the manufacturing plant of the Wiarda Company, causing a loss of about $75,000. The company were fortunate in having a storage warehouse a block away which was not touched by the fire. Here they kept a large reserve stock and are in a position to give prompt shipment on all articles. As soon as the insurance matters have been adjusted the company will start to rebuild and expect to have at least a part of their plant in operation within a few weeks.

INCREASE OF CAPITAL STOCK

The Newburyport Silver Company, Keene, N. H., have increased their capital stock to $350,000, all common stock.

The Allyne Brass Foundry Company, Cleveland, Ohio, has increased its capital stock from $50,000 to $125,000. No factory extensions are contemplated.

The Standard Aluminum Company, Two Rivers, Wis., has increased its capital stock from $50,000 to $100,000 and is in the market for machinery for a new building now in course of construction.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

THE UTICA BRASS & MACHINE COMPANY, Fort Worth, Texas. Capital, $5,000. Incorporators: G. M. Bird, F. L. Lightfoot and R. L. McCoy, all of Forth Worth.

THE NON-CORROSIVE METAL MANUFACTURING COMPANY, Watertown, Mass. Capital, $10,000. Incorporators: G. D. Reed, K. M. Ford and Herbert E. Reed, all of Watertown.

THE NILES-BEMENT-POND COMPANY, Boston, Mass. Capital stock, $25,000. To manufacture machinery. Incorporators: M. Chase, H. M. Cleaver and E. J. Edwards, Jr., all of Boston.

THE ANCHOR BRASS & ALUMINUM COMPANY, Cincinnati, Ohio. Capital, $10,000. To manufacture metal articles. Incorporators: Gustav A. Wendt, George H. Wendt, Samuel Hummel, and others, all of Cincinnati.

Upon the death of Francis Hendricks, senior partner of the firm of Hendricks Brothers, the copper manufacturers, with

offices at 49 Cliff street, New York, the firm has taken out papers of incorporation under the laws of the State of New York, with the title of Hendricks Brothers, Inc. Officers, Harmon W. Hendricks, president; Edwin J. Keane, secretary and treasurer. The business will be continued as formerly.

The metal industry will be glad to know that the long established Tubal Smelting Works of Paul S. Reeves & Son, 1415 Catherine street, Philadelphia, have solved their financial difficulties and are now in a position to carry on the plant in a better shape than formerly. The business has been incorporated under the name of Paul S. Reeves & Company, with a capital stock of $160,000. The manufacturing and selling end will be under the same management as heretofore, and due to the re-financing the new company will be in a position which will enable them to handle business to better advantage than has been the case in the past. Since the old firm was put in bankruptcy the business has been running continuously under first a Receiver and then a Trustee, and the firm's customers have been supplied with the different metals and castings made from the special alloys and compositions which have made the name of Paul S. Reeves & Son so well known to metal consumers throughout the entire United States. The company make phosphor, bronze, manganese bronze, composition metals, babbitt metals, acid-resisting bronze, white brass and phosphor copper; also castings weighing up to 20,000 pounds.

PRINTED MATTER

Babbitt: The Ajax Metal Company, Philadelphia, give a description and report of tests on the Ajax Bull Babbitt in a small folder recently issued.

Antimony: C. W. Leavitt & Company, 30 Church street, New York, have issued a folder in the interests of their H. H. brand of French antimony, guaranteed to be 99 per cent. pure, which they recommend for use in anti-friction, britannia and type metals for all mixtures requiring high grade antimony.

Presses: The V & O Press Company, Brooklyn, N .Y. A description of punching and reducing presses, manufactured by this company, together with illustrations of the same, is given in a card calendar recently issued. Circulars relating to these presses will be forwarded upon request.

Polishing and Bending Machinery: The Tube Bending and Polishing Machine Company, Baltimore, Md., have issued Bulletin No. 1, under date of January 1, giving illustrations and description of their automatic grinding and polishing machinery for pipe, tube and rod. These machines are described in the industrial department of this issue of THE METAL INDUSTRY. Copies of the circular sent upon request.

Bakelite: The General Bakelite Company, New York, have issued "Information Booklet No. 2," under date of March, 1912. This booklet gives a complete description of the origin of Bakelite, of the various forms in which it is made, and also of the uses to which it may be put. The latter portion of the booklet is given over to photographs of the various applications of Bakelite. Copies on request.

Portable Ovens: Hermann Gehnrich, New York, describes in a new catalog his line of new strictly indirect gas heated radiator type ovens which are used for japanning, lacquering and drying out of materials that are liable to be affected by fumes of gas or emit combustible vapors. The catalog also describes special ovens for sherardizing drawing, temper and bluing. Sample copies of the catalog will be mailed upon request.

Wire Mill Equipment: The Morgan Construction Company, Worcester, Mass. A complete description of the equipment of wire mill machinery for steel brass, copper and bronze is contained in the new catalog recently issued by the above concern. Among the various kinds of machinery and apparatus which are described are the following: Drawing frames, pot and muffle annealers, dry houses, cleaning cranes, and vats, galvanizing equipment, mill trucks, pointers' reels, die reaming lathes, etc.

Emery Grinders: The Gem Manufacturing Company, Pittsburgh, Pa. A small two-page booklet has been issued by the above company, giving illustrations and descriptions of their portable emergy grinders, drills, drill presses, center grinders, tapping and reaming machines and electric polishers. The booklet also contains a complete list of the extensive line of Gem patent oilers manufactured by this company. Sample copies of the catalog will be mailed upon request.

Non-Ferrous Castings and Ingots: The Lumen Bearing Company, brass founders, Buffalo, N. Y. An innovation in the way of a catalog has been issued by the above company as descriptive of their metal products. These products include the following: Lumen bronze, manganese bronze, phosphor bronze, yellow brass, red brass, aluminum, white metal die castings, babbitt metals, solder, aluminum solder, trolley wheels and ingot metals. The catalog is composed of forty pages, printed on heavy coated paper and containing handsome full page half-tone cuts of the various departments of the works. The most interesting feature of this catalog is the fact that the story that the Lumen company wishes to tell is told in its greater part by the pictures, which are so clear and attractive as to make one feel as though he were actually walking through the works rather than looking at a mere ink and paper representation. The text explaining the pictures is placed on the page preceding each picture and there is expressed in brief language an explanation of the operation shown opposite. The catalog is concluded with a diagram showing how the high efficiency of the company is maintained by the scientific organization of the management and staff. Sample copies will be mailed upon request.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at THE METAL INDUSTRY office, 99 John street, New York. THE METAL INDUSTRY is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

ADNEWS

A. W. Copeland, Vermilion, O., offers to send samples of Copeland Parting Compound on request.

P. J. Cahill, Leeds, Mass., advertises in this issue his brass workers' tools for monitors, all kinds of special brass work for plumbers supply manufacturers, and a patent spring chuck attachment for monitor lathes.

Williamsville Buff Mfg. Company, Danielson, Conn., announce that they wish to contradict the rumor that they anticipate changing the quality of cloth in their well-known cotton buffs, which will remain the same in every particular.

The Hawley Down Draft Furnace Company, whose fine new plant at Easton, Pa., was recently described in THE METAL INDUSTRY, announce in the advertising pages that they are now better equipped than ever for manufacturing Hawley-Schwartz furnaces for the melting of brass, aluminum, iron, steel, etc.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

METAL MARKET REVIEW

NEW YORK, April 8, 1912.

COPPER.

Owing to the aggressive manipulation in the London speculative market, combined with the persistent pegging of prices in New York, the market value of ingot copper has been pushed up over 1½ cents per pound during the last few weeks, and the talk is of still higher figures.

With the general trade conditions known to exist in England, with labor troubles and more or less unrest on the Continent, the movement of standard copper in London cannot in any way be taken as a criterion of genuine demand for the metal.

The whole movement from beginning to end has been artificial and entirely speculative, helped along with buying orders from New York, and with the short interest in London now probably covered, and the crowd there all bulls the end may not be so very far away.

Consumers have bought freely, there has been no crazy demand at any time and without the London manipulation the home prices could not have been moved ½ cent per pound. The foundries are not rushed with orders and high class scrap copper that ordinarily sells within ½ cent a pound of ingot copper cannot today be sold within 2 cents of the ingot copper market and this condition of scrap copper pretty well tells the whole story of the home copper market.

Extracts from mail advices from London of March 22 say: "The buying here has been chiefly of a speculative nature, and has readily absorbed the large amounts which have been liquidated. Consumers in this country, owing to the continued deadlock in the coal dispute, have naturally done little."

That letter pretty well confirms our views of the copper boom. The business here does not justify the advance, prices are artificially high and unless London keeps on buying we are bound to have a reaction.

Statistically the metal is in pretty good shape, the foreign stocks show a further decrease of 1,400 tons, about 3,146,000 pounds for the month, and the home stocks are supposed to show probably a decrease of 6,000,000 pounds more during March.

At the end of March Lake copper was quotable at 15¾ cents; electrolytic, 15⅝, and casting 15½, with the early days of April 16 cents is being quoted.

TIN.

The tin market has been more normal during the month of March than at any time for months. Opening at 43 cents, and closing at 43¼, with fluctuations of only ¾ of a cent either way. The demand has been very good, estimated as 4,000 tons.

The market for spot tin is around 43 cents, with futures about ¼ cent lower.

LEAD.

The lead market is rather firmer and the trust has advanced its figures about ¼ of a cent per pound. The price today is 4¼ New York, with higher prices likely in the near future.

SPELTER.

The spelter market has held very firm and prices have been up to 7 cents New York, at the close the market is rather easier at 6.85, and with better weather out West the supply is likely to increase. Sheet zinc has been advanced to 8.65 carload lots f. o. b. smelter—casks lots from store are quotable at 9¼ cents.

ALUMINUM.

This market has been rather more active and prices have been up to 19½ cents for 98-99 per cent., pure ingots closing today at 19¼ cents for round lots.

ANTIMONY.

Cooksons put their price up to 8 cents just as suddenly as they dropped it last month. Halletts is quotable at 7¾ cents, and Chinese is around 6¾ to 6⅞ cents.

SILVER.

The market for silver has been dull, and the active speculation in this metal has ceased. Opening at 58¾ cents New York, and closing at 58⅛, while London is quotable at 26¾d.

QUICKSILVER.

The wholesale price for quicksilver is down to $43.50, against $46 per flask a month ago; jobbing lots are quotable at $44 to $45 per flask.

SHEET METALS.

Sheet copper has been advanced to 21 cents base for hot rolled and 22 cents for cold rolled, copper wire to 17 cents; all quotations have been withdrawn and higher prices are looked for. Brass products have been advanced ½ cent per pound, high sheet brass is quotable at 16¾ cents base.

OLD METALS.

The old metal market is dull and in a state of wonder at the extraordinary advance in the copper market in the face of the absolute neglect of buyers and consumers of scrap copper to come into the market. With ingot copper quotable today at 16 cents, it is impossible to sell heavy clean copper with 2½ cents of the market, while with copper selling actually and needed at 16 cents, scrap should be in demand at 15 cents.—J. J. A.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

		April 9, 1912. Pounds.
Stocks of marketable copper of all kinds on hand at all points in the United States, March 1, 1912..		62,939,988
Production of marketable copper in the United States from all domestic and foreign sources during March, 1912		125,694,601
		188,634,589
Deliveries:		
For domestic consumption.....	67,487,466	
For export	58,779,566	
		126,267,032
Stocks of marketable copper of all kinds on hand at all points in the United States, April 1, 1912...		62,367,557
Stocks decreasd during the month of March.....		572,431

MARCH MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	15.75	14.50	15.00
Electrolytic	15.65	14.40	14.75
Casting	15.45	14.25	14.60
TIN	43.25	42.00	42.80
LEAD	4.25	4.00	4.10
SPELTER	6.85	6.60	6.75
ANTIMONY (Hallett's)	7.75	7.40	7.50
SILVER	.58¾	.58	.58⅜

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.:

1911—Average for year 12¾. 1912—January, 14½; February, 14½; March, 15 cents.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INFORMATION BUREAU

Any firm intending to buy metals, machinery or supplies, and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds. Address THE METAL INDUSTRY, 99 John street, New York.

Metal Prices, April 8, 1912

NEW METALS.	Price per lb. Cents.
Copper—Pig, Bar and Ingot and Old Copper. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	16.00
Electrolytic, carload lots	15.85
Casting, carload lots	15.75
Tin—Duty Free.	
Straits of Malacca, carload lots	43.00
Lead—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.25
Spelter—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western, carload lots	6.85
Aluminum—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	25.00
100 lb. lots	20.00
Ton lots	19.50
Antimony—Duty 1½c. per lb.	
Cookson's cask lots, nominal	8.00
Hallett's cask lots	7.75
Chinese	6.75
Hungarian grade	6.75
Nickel—Duty Ingot, 6c. per lb. Sheet, strips and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots, Blocks according to quantity	.40 to .50
Manganese Metal—Duty 20 per cent	.90
Magnesium Metal—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	1.50
Bismuth—Duty free	2.00
Cadmium—Duty free	.90
Chromium Metal—Duty 25 per cent. ad val	.98
Quicksilver—Duty 7c. per lb	.62
	Price per oz.
Gold—Duty free	$20.67
Platinum—Duty free	45.50
Silver—Duty free	.58¼

Dealers' Buying Prices. Cents per lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
13.25 to 13.50	Heavy Cut Copper	14.50 to 14.75
13.00 to 13.25	Coppy Wire	14.25 to 14.50
11.75 to 12.00	Light Copper	12.75 to 13.00
11.00 to 11.25	Heavy Mach. Comp	12.50 to 13.00
8.75 to 9.00	Heavy Brass	10.00 to 10.25
6.75 to 7.00	Light Brass	8.00 to 8.25
8.25 to 8.50	No. 1 Yellow Brass Turnings	9.25 to 9.50
9.75 to 10.00	No. 1 Comp. Turnings	10.75 to 11.25
3.50 to ——	Heavy Lead	—— to 3.75
4.75 to ——	Zinc Scrap	—— to 5.25
5.00 to 5.50	Scrap Aluminum, turnings	6.00 to 7.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 17.50
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

INGOT METALS.			Price per lb. Cents.
Silicon Copper, 10%	according to quantity		25 to 31
Silicon Copper, 20%	"	"	28 to 30
Silicon Copper, 30% guaranteed	"	"	30 to 32
Phosphor Copper, guaranteed 10%	"	"	22 to 25
Phosphor Copper, guaranteed 15%	"	"	23 to 29
Manganese Copper, 25%	"	"	35 to 40
Phosphor Tin, guaranteed 5%	"	"	49 to 50
Phosphor Tin, no guarantee	"	"	48 to 50
Brass Ingot, Yellow	"	"	10¾ to 11½
Brass Ingot, Red	"	"	12½ to 14
Bronze Ingot	"	"	13¾ to 14½
Manganese Bronze	"	"	18½ to 20
Phosphor Bronze	"	"	13 to 16
Casting Aluminum Alloys	"	"	17⅜ to 18⅝

Phosphorus—Duty 18c. per lb.
According to quantity ..... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 21.00 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7¾ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7¾ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over ..... Base Price.
(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

ZINC—Duty, sheet, 1⅝c. per lb.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill	8.65 less 8%
Casks, jobbers' prices	9¼
Open casks, jobbers' prices	10

Metal Prices, April 8, 1912

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect April 1, 1912, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.15½	$0.17	$0.18½
Wire	.15¼	.17	.18½
Rod	.15¼	.17¾	.19½
Brazed tubing	.20¼	——	.23½
Open seam tubing	.18⅞	——	.21¾
Angles and channels, plain	.19¼	——	.21⅞

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass... ½c. per lb. net advance
" —Best spring, drawing and spinning brass.... 1½c. " " " "
Wire—Extra spring and brazing wire..... ½c. " " " "
" —Best spring and brazing wire..... 1c. " " " "

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.16¾	$0.18¼	$0.19¾
Wire	.16½	.18¼	.19¾
Rod	.16½	.19	.20¾
Brazed tubing	.21½	——	.24½
Open seam tubing	.20⅛	——	.22½
Angles and channels, plain	.20½	——	.23

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass... ½c. per lb. net advance
" —Best spring, drawing and spinning brass.... 1½c. " " " "
Wire—Extra spring and brazing wire..... ½c. " " " "
" —Best spring and brazing wire..... 1c. " " " "

BARE COPPER WIRE—CARLOAD LOTS.

17.50 per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	19c. per lb. base
100 lbs. to 300 lbs. in one order	19½c. " " "
Less than 100 lbs. in one order	21c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 20c. per lb.
Seamless Copper Tubing, 23c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	28	27	22	21	20	20	20	20	20	20	20	21	22	24	26	27

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet— Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1½ inch	25	27
1¾ inch	32	35
1⅞ inch	45	48
2 inch	56	60

Discount 50%.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Red	17½c. net base
Muntz or Yellow Metal Sheathing (14" x 48")	16½c. " "
" " " Rectangular sheets other than Sheathing	18½c. " "
" " " Rod	16½c. " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 24¾c. net.
German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.
Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.
Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than..... 3in. and including..... 12in.	6in. 14in.	14in. 16in.	16in. 18in.	18in. 20in.	20in. 24in.	24in. 30in.	30in. 36in.	36in. 40in.
	in coils.								
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	39
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	43
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	72
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	45	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	159	174	..	..
" 38	..	124	139	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	57
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb.	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent. to No. 19, B. & S. Gauge, inclusive	$0.60
6 " " 19, " " "	.70
9 " " 19, " " "	.85
12 " " 19, " " "	1.00
15 " " 19, " " "	1.15
16 " " 19, " " "	1.20
18 " " 19, " " "	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.
For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.
Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.